The Electrical Industry's Weekly Magazine

September 2, 1957

Electrical World

Price 60 Cents

A McGraw-Hill Publication

8th Annual Electrical Industry

FORECAST

1957-1970

...Page 91

What Warning Can You Get on Hurricanes?
A Wrap-Up on Detection, Tracking ...Page 70

reasons for remarkable service of ALLIS-CHALMERS 3-phase regulators

Longest contact life

Heavy components and rigid design maintain highest contact pressures available in industry and assure long service life because . . .

- High contact pressure minimizes contact blowback caused by severe short circuits.
- Contact bounce and consequent pitting and burning are reduced.
- Large contacts increase thermal capacity.
- Quick-break mechanism snaps contacts fast for reduced arcing time.
- Contacts made of sintered RS-1045 greatly resist pitting and burning.

These are just a few of the many reasons for the outstanding service record of Allis-Chalmers 3-phase regulators. For complete details, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-5459

ALLIS-CHALMERS

Electrical World

Vol. 148, No. 10 September 2, 1957

Published for 83 years for those engaged in the busines of generating, transmitting, distributing, or applying electric power

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this feature of CM-OT provides light weight and unusually high compressive strength

It's the corrugated bronze tape that makes CM-OT particularly suitable for direct burial power and control circuits. It provides a cable that is light weight, has high compressive strength, and whose cost approximates standard rubber-insulated, neoprene-sheathed cables. In addition, the bronze tape serves as an excellent shield and ground for control cable circuits in those utility and industrial applications where these are considered desirable.

The CM-OT sheath consists of a 5-mil, helically-wrapped, corrugated bronze tape . . . a wall of Okoprene reinforced with an Okoprene-filled cable tape . . . and an outer wax and mica lubricated finish. While primarily designed for multi-conductor signal and control cables, the CM-OT sheath can be supplied over single and multi-conductor power cables with conductor sizes as large as #4/0 Awg.

Here are just some of the basic direct burial installation requirements that CM-OT meets: resistant to earth pressures, water, corrosion, electrolysis, fungi, insects and small rodents, lightning surges and extremes of temperature. It is flexible and easy to handle, splice and terminate with conventional tools . . . can be installed in long lengths (1500-2500 feet or longer) . . . adaptable for aerial, underground duct, rack or conduit installations . . . long life and reliability.

For more complete details, write for Bulletin EW-1086 to The Okonite Company, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

4741

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. . . from the publisher

Audience Participation . . .

What features do you read most in Electrical World? If you're like the majority of our readers, they're most likely these three:

1. Electrical Newsletter (page 19)
2. Management Newsletter (page 143)
3. Editorials (page 75)

Two of these features—the Electrical and Management Newsletters—are brand new to the magazine. But since their first appearance in our Jan. 6 issue, they've been consistent top runners in our regular readership studies.

Eight months ago they didn't even exist. Today they are regular standbys. That raises the question: What other features are there that you could use like these—but are as yet unthought of?

This is a question that our editors continually have in mind as they seek and develop new and better ways to serve our readers.

And it's the readers themselves who many times supply the answer. The Electrical Newsletter, with its fast, indexed preview of the weeks events, was one of them. It was generated from suggestions by utility executives and engineers in Kentucky and Washington D.C.

Maybe you have some ideas, too.

Fischer Black

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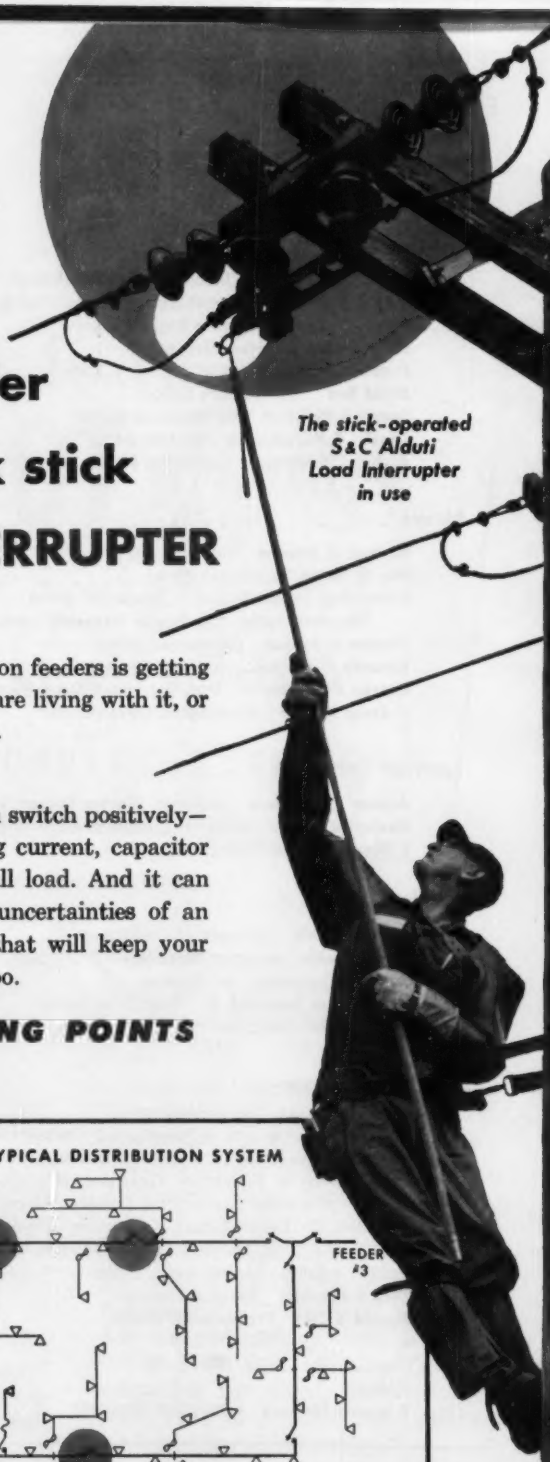
Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.

he can switch your 12 kv feeders anywhere, any time, under any load with a hook stick using an S&C LOAD INTERRUPTER



The stick-operated S&C Alduti Load Interrupter in use

Sure! The switching of your 12 kv distribution feeders is getting tougher and tougher! Maybe your linemen are living with it, or maybe you are spending a fortune just to get by.

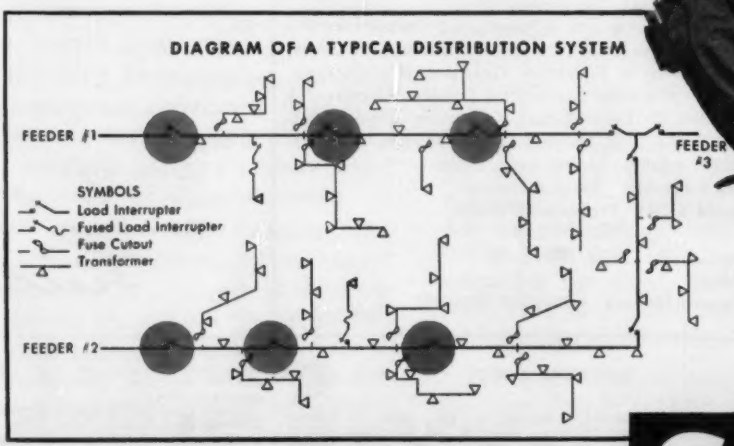
Is there another alternative?

Certainly! A stick-operated S&C Load Interrupter. It can switch positively—under any condition—any load, whether it's line charging current, capacitor charging current, magnetizing current, or full load. And it can be done without the hazards and uncertainties of an external arc. Here's a switch that will keep your linemen happy, and the comptroller, too.

USE IT AT SECTIONALIZING POINTS

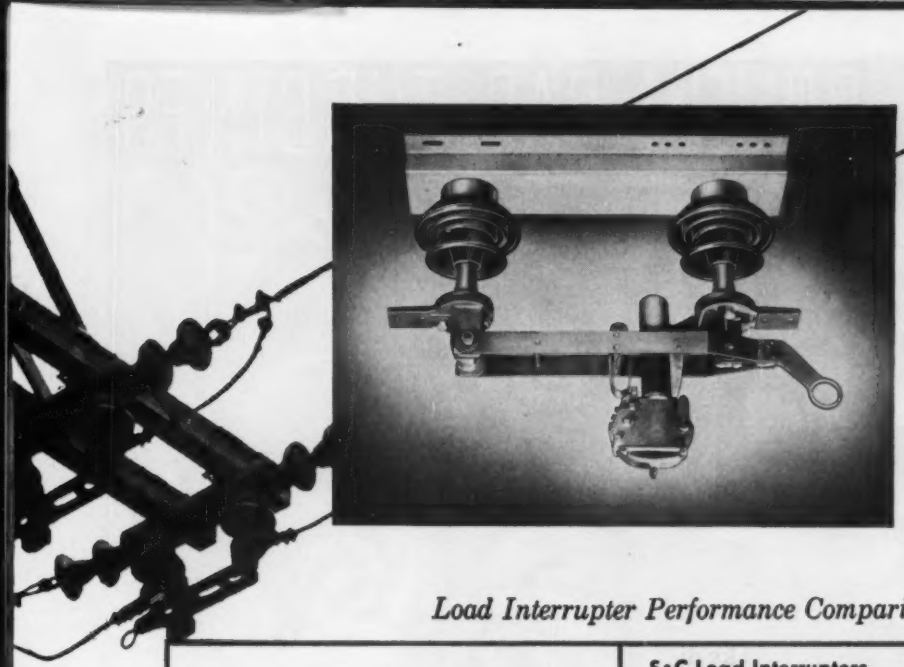
On 12 kv *radial* circuits, increased loads have made switching at sectionalizing points virtually impossible with conventional disconnects. On *loop* circuits (right) it's difficult enough where the duty involves only switching in parallel. And if the tie switches are open, hazard-free circuit interruption can be an impossibility.

Here, S&C Load Interrupters will give you safe, positive, circuit interruption on full line voltage and full load current—an advantage under emergency conditions, and a convenience under normal circumstances.



Specialists in High-Voltage Circuit Interruption since 1910

S&C



The S&C Load Interrupter, Alduti type; outdoor, single pole, (stick-operated); 14.4 kv, 600 amp. Three-pole, group-operated load interrupters are also available.

Load Interrupter Performance Comparison

PERFORMANCE	S&C Load Interrupters		Conventional Disconnects	
	Stick-Operated	Group-Operated	Stick-Operated	Group-Operated
Interrupt current from parallel sources safely?	YES	YES	DOUBTFUL	DOUBTFUL
Safe to equipment or personnel if inadvertently opened on full voltage (in case loop is open)?	YES	YES	NO	DOUBTFUL
Dump load without opening feeder breaker, or without preliminary unloading?	YES	YES	NO	DOUBTFUL
Multi-pole device controllable from ground (may be required by system practice or other circuits on same pole)?	NO	YES	NO	YES
Interrupt line charging current safely?	YES	YES	NO	DOUBTFUL
Cost?	LOW	HIGHEST	LOWEST	HIGH

The S&C Load Interrupter can switch the circuit without unloading preliminaries and without opening the breakers. The use of S&C Load Interrupters cannot lead to dangerous phase-to-phase or phase-to-ground faults, because there is NO EXTERNAL ARC. Also there is no danger to men or equipment in case of inadvertent operation. The S&C Load Interrupter breaks all load and charging currents instantly and decisively. Besides, you can mount it in any desired position —vertical, upright, or inverted. Write today for Catalog Section 760 on S&C Load Interrupters.

LOAD INTERRUPTERS

S&C ELECTRIC COMPANY

4401 Ravenswood Avenue • Chicago 40, Illinois, U. S. A.
In Canada, S&C Electric Canada Ltd., 5 Vanzo Road, Toronto 14, Ontario
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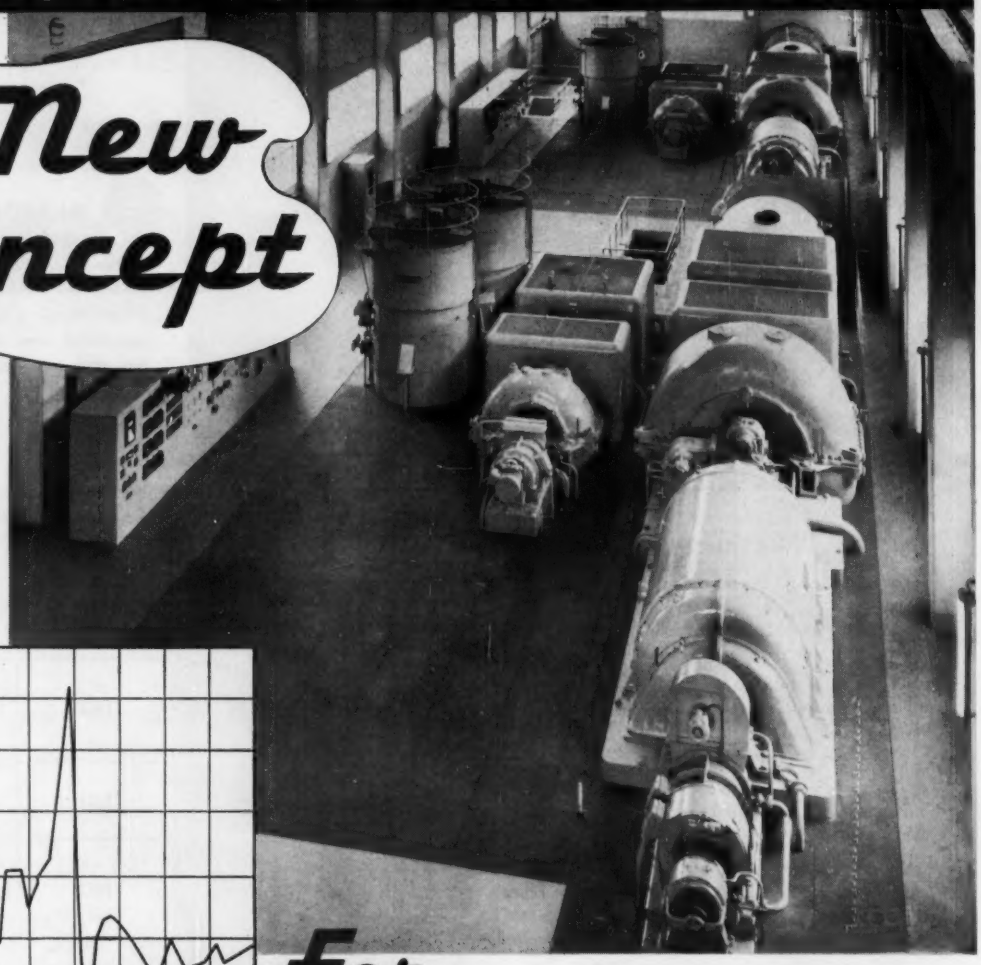
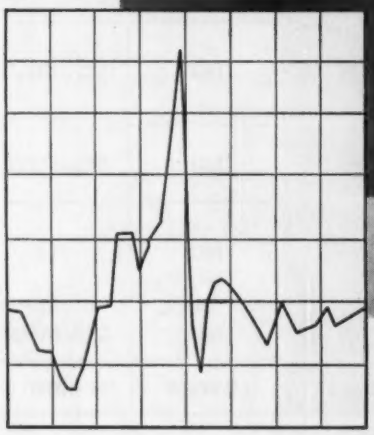
BROWN BOVERI GAS TURBINES

A New Concept





For Peak Loads

DEPENDING on the load, either the 7,000 kW single shaft or the 25,000 kW non-regenerative cycle Brown Boveri Gas Turbine provide the answer to the rigid demands of peak load service. *They can be put on the line in 20 minutes or less.*

Their on-the-job performance records—in over 60 power plants throughout the world—conclusively indicate not only economy of operation but sizeable savings in initial costs.

If your problem is *peak* or *base* load service, it will pay you to investigate Brown Boveri Gas Turbines.

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ground rules
FOR GOOD GROUNDS
FOR RELIABLE, LOW-RESISTANCE GROUND CONNECTIONS THE YEAR 'ROUND . . .
use the proved, low-cost method of deep grounding with Copperweld Sectional Ground Rods.
drive multiple sections —as many as are needed to reach the good conducting soils of constant moisture.
measure resistance after each section is driven, allowing for seasonal variation.
to be sure of permanence be sure to drive Copperweld the only Molten-Welded ground rods.

YOU'RE *Positive* WITH THE **MOLTEN-WELD**

Once it's driven, your ground is in to stay, when it's non-rusting Copperweld. This micro-photograph of the weld area shows how the grains of copper and steel interlock to form a permanent, continuous weld. No other process achieves this inseparable union.

By following these practical ground rules, using Copperweld* Sectional Ground Rods, you can be certain you'll get the very best results from your protective equipment—not only during wet seasons, but throughout the year. There's no better or more economical way to improve line performance, increase safety, and reduce service interruptions.

**Trade Mark*

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

***Drive DEEP* with**

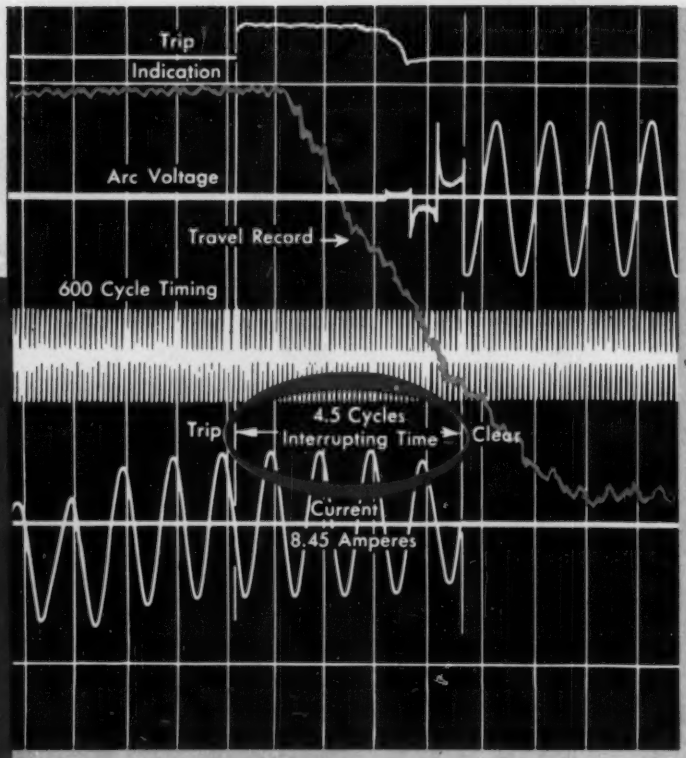
Copperweld
TRADE MARK

sectional ground rods

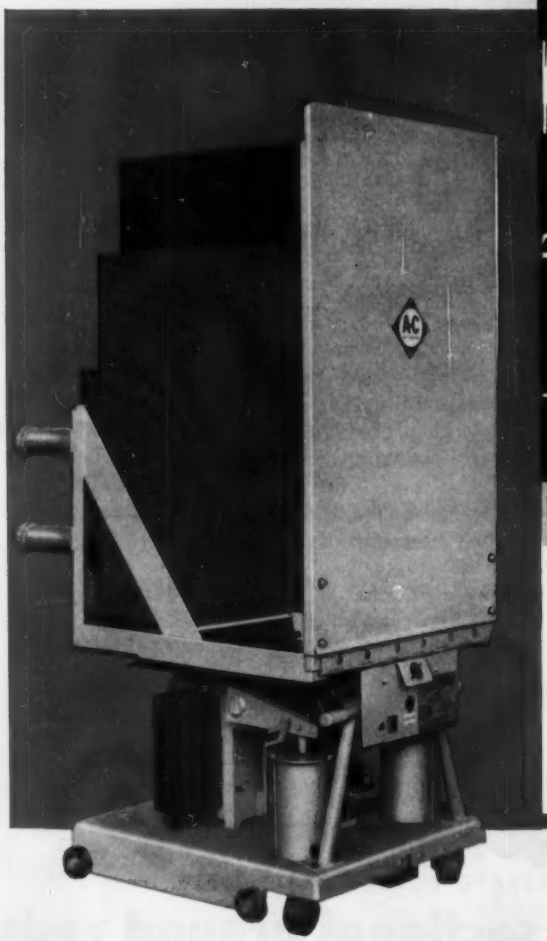
Get 5-cycle interruption with

Reduce conductor sag—

For greatest benefit, fast interruption of all currents is essential. These oscillograms, typical of Allis-Chalmers air magnetic breakers, show fast clearing time on low, medium, and high currents.



FAST ON LOW CURRENTS



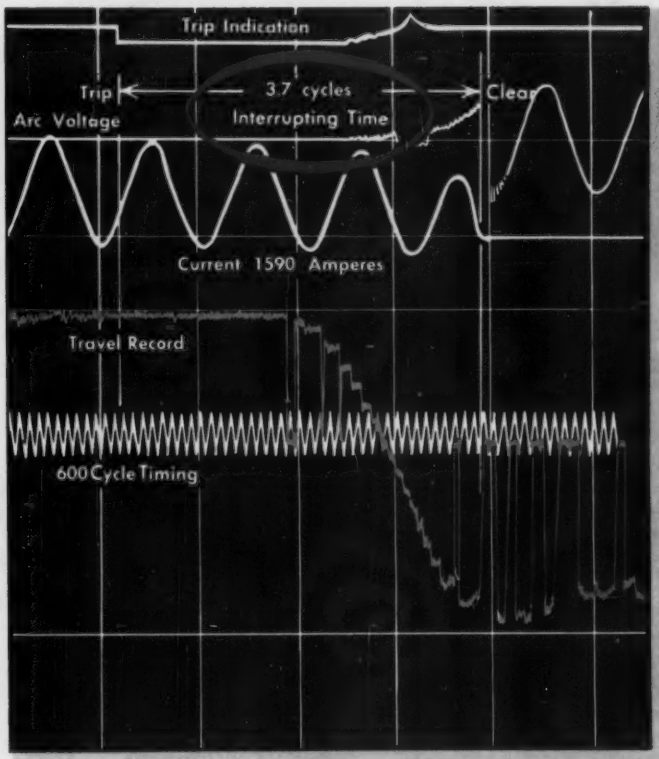
Fast clearing time reduces the damage of a fault to the system. Problems of sagging wires, annealing, and burndown are reduced. Outages are often eliminated.

All Allis-Chalmers air magnetic switchgear

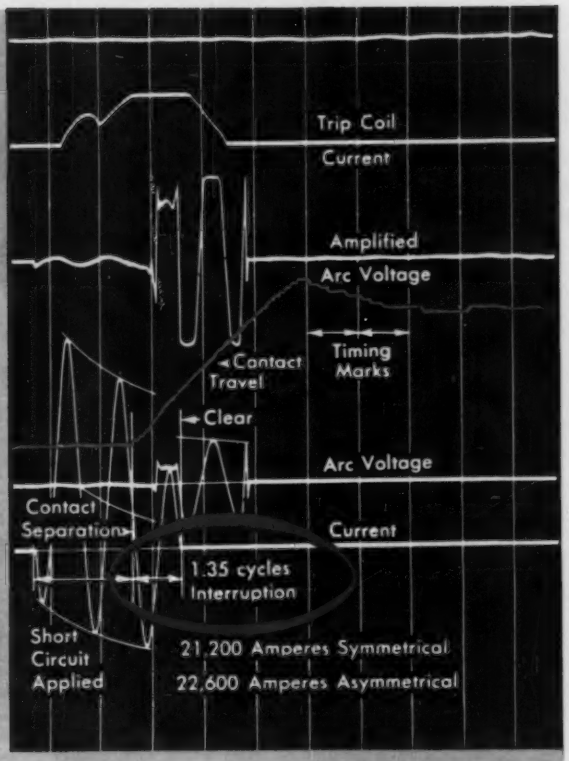
ALLIS-

all Allis-Chalmers air magnetic breakers

annealing—burndown



FASTER ON MIDRANGE CURRENTS



FASTEST ON HIGH CURRENTS

assemblies and primary unit substations are equipped with 5-cycle *Ruptair* breakers.

For additional information, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Ruptair is an Allis-Chalmers trademark.

For Progress in Switchgear

CHALMERS

A-C ALLIS-CHALMERS

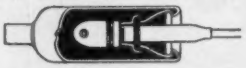
A-5470

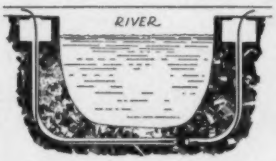
10,000 FEET OF CONDUIT RODDED IN 8 HOURS!

Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.





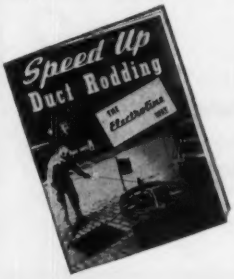
EASY DOES IT!—It's all in a day's work with Electroline Steel Duct-Rodding Equipment rodding 10,000 feet of conduit!

Light in weight, easily handled and stored, low upkeep: these are a few of the advantages utility men know to be true. But even bigger, more important advantages are—

- *Savings in the cost of labor*—for example, where it formerly took two gangs from one to two weeks on a given job, one gang, *in one-half hour*, has completed the same job—using Electroline Duct-Rodding Equipment.
- *Savings in original cost*—you get long life—double that of other types—when you buy Electroline Duct-Rodding Equipment. Add to that this fact: this equipment costs just about half as much for equivalent capacity! *There's true economy.*
- *Savings in Total Investment*—fewer sets are required because of the speed with which a job is completed and the equipment moved to other locations.

Speed up installation, reduce your costs; start now to use Electroline Duct-Rodding Equipment. Available for 3", 3½" or 4" Duct.

We've got a 4-page brochure which describes and illustrates more completely how this equipment can benefit you. We'll gladly send you a copy. Write us.



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Electroline Company

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In Canada: POWERLITE DEVICES, LTD., TORONTO

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Asplundhs work *exclusively* for the Public Utilities of America.

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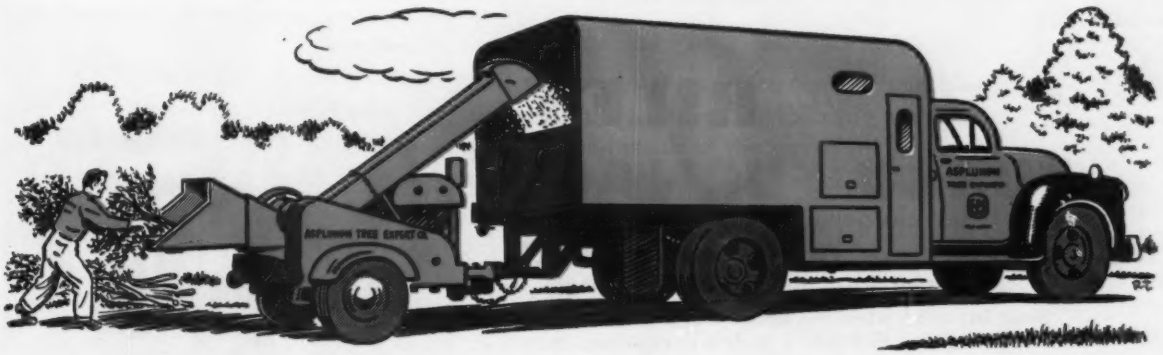
This specialization applies to our trained personnel, superior supervision, modern equipment, complete insurance coverage, safe operation, strategically located service centers, and sound administration policies. We'd like to talk it over with you!



Write for your copy of our new EMERGENCY FOLDER, with day and night listings of Asplundh men to call when a storm makes special, fast tree work imperative.

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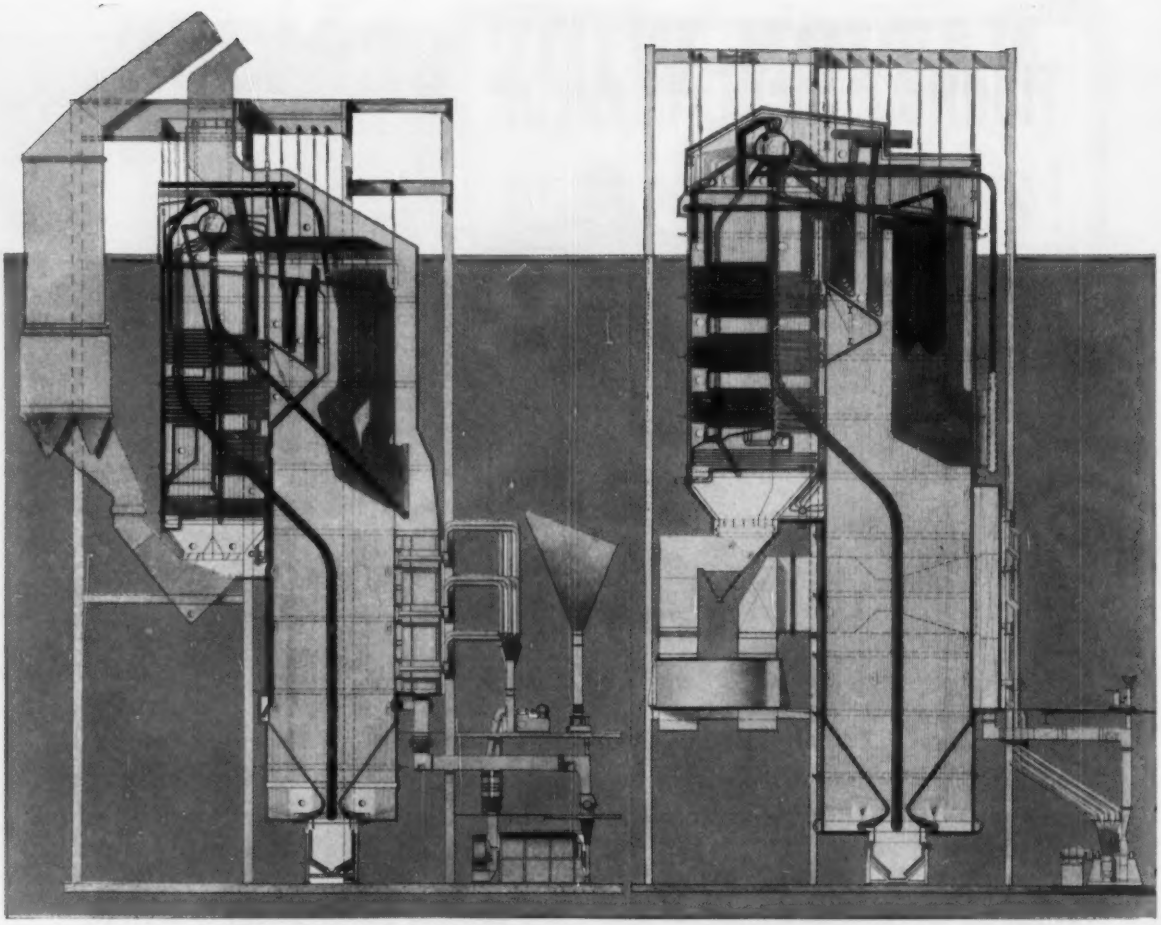
Jenkintown, Pa. and principal cities



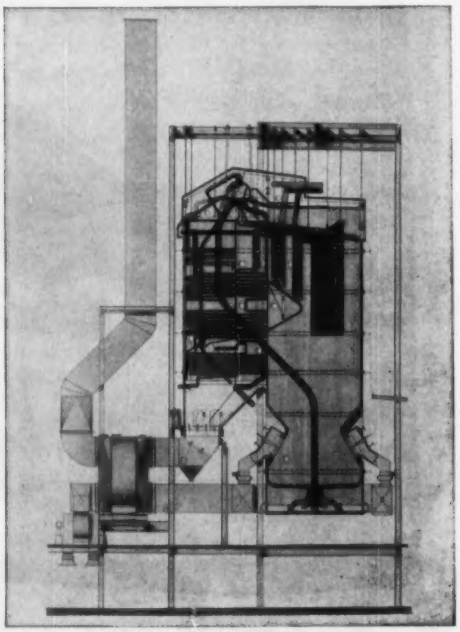
Public Service Co. of Indiana, Inc. — New Albany
Two Units — 1,000,000 lbs/hr; 2075 psig; 1005/1005 F
Sargent & Lundy, Consulting Engineers

The Hartford Electric Light Co. — Middletown, Conn.
800,000 lbs/hr; 2100 psig; 1005/1005 F
Stone & Webster Engineering Corp., Consulting Engineers

The RILEY TURBO FURNACE

the design of the future that's HERE!

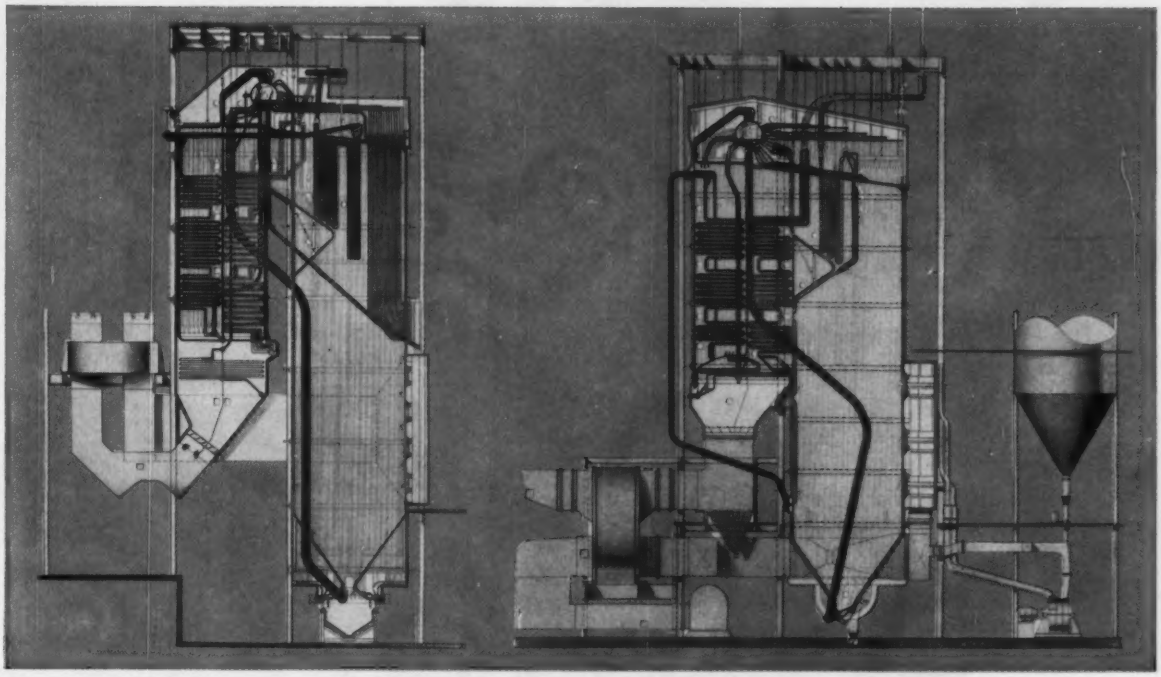
Since late 1955, when this design was first announced, 19 Riley TURBO FURNACE boilers in capacities from 150,000 to 1,600,000 lbs/hr have been sold, eight of them to public utilities. This rapid acceptance is a result of the TURBO FURNACE'S exceptional performance characteristics and its ability to utilize multiple fuels. Users, burning oil or gas initially, can switch to solid fuels in the future without the costly delay caused by conversion of furnace and heating surfaces. A wide range of coal, lignite or other solid fuels can be burned; with fly ash reinjection in the furnace unburned losses are negligible. In addition, the Riley TURBO FURNACE boiler has all burners on one level with a consequent reduction in overall height.



825,000#, 1750 psi., 1005 F. Reheat
TURBO FURNACE

Current RILEY Reheat Designs

PULVERIZED COAL FIRED



Central Illinois Light Company — R. S. Wallace Station
690,000 lbs/hr; 1650 psig; 1000/1000 F
Commonwealth Associates, Inc., Consulting Engineers

Minnesota Power & Light Co. — Clay Boswell Station, Duluth
Two Units — 500,000 lbs/hr; 1725 psig; 1005/1005 F
Ebasco Services, Inc., Consulting Engineers

The use by public utilities of Riley Reheat Units for all capacities and steam conditions has climbed rapidly and steadily during the past decade. This gratifying acceptance is the result of the record of performance, dependability and continuity of operation established by Riley units.

The designs illustrated on these pages are typical of those currently being supplied for pulverized coal firing. They are just a few of many Riley central station designs. Let our sales engineers show you others.

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

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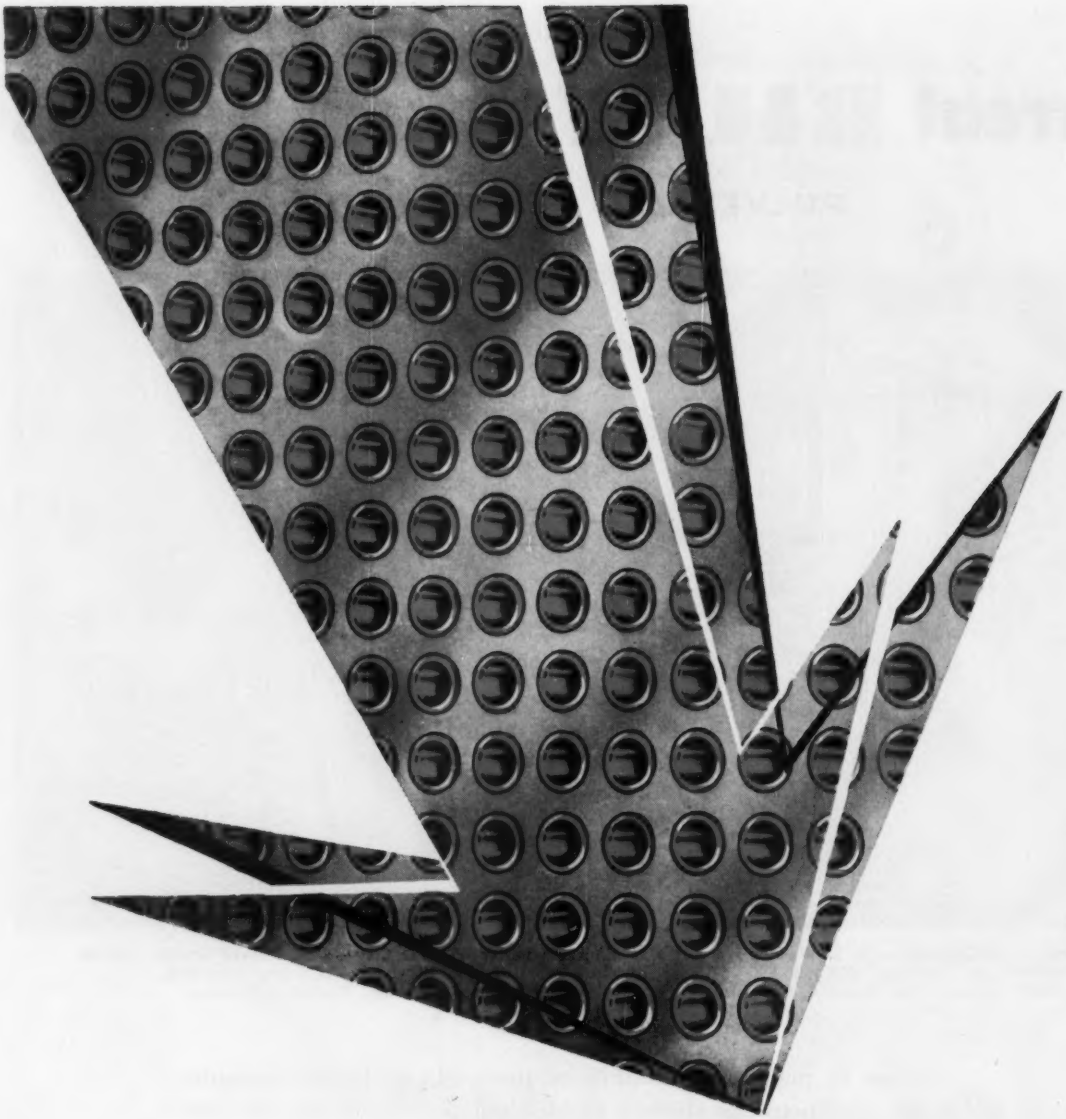
Stoker Corporation
WORCESTER, MASSACHUSETTS

Sales Offices: Worcester, New York, Philadelphia, Buffalo, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Houston, Denver (Englewood), Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.



CHASE® CONDENSER TUBES

point to extra years of service!

Since 1935 – when Chase first perfected Antimonial Admiralty Condenser Tubes–more than 120 million lbs. have been installed and the problem of dezincification has been virtually eliminated. Precise alloying plus an unrivaled standard of quality control produces these condenser tubes with 'built-in' longer life. Such a product *must* be your aim for reduced operating costs, far greater time between replacements. There's much more to the Chase story! Make it a point to find out! Write, now, for your free 54-page manual: "*Chase Condenser and Heat Exchanger Tubes.*"

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HOLOPHANE Prismatic Units

Custom-Engineered for your Lighting

Exact specification is the basis of an optical prescription... The same holds true in planning any form of lighting... Holophane's undeviating precision in manufacturing prismatic products for lighting just can't be duplicated by "rolling" methods. Every Holophane lens is individually PRESSED — one by one — on equipment specially built for the operation. It is only by this careful process that we can keep the prismatic patterns precise enough to *direct and control* the light with utmost accuracy. This craftsmanship makes the difference between *specification* and *approximation*... Holophane CONTROLENS*, Reflectors and Refractors are the vital components of *custom-engineered* lighting systems, scientifically designed for the specific purpose... They offer finest quality, consistently predictable performance, and low cost per unit in terms of light delivered.

To be sure of quality... look for the name Holophane impressed in each piece

HOLOPHANE

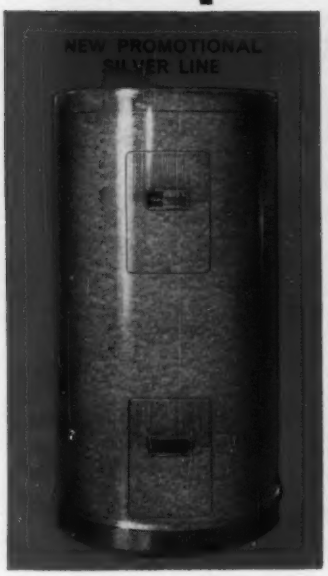
COMPANY, INC. • *Lighting Authorities Since 1898*

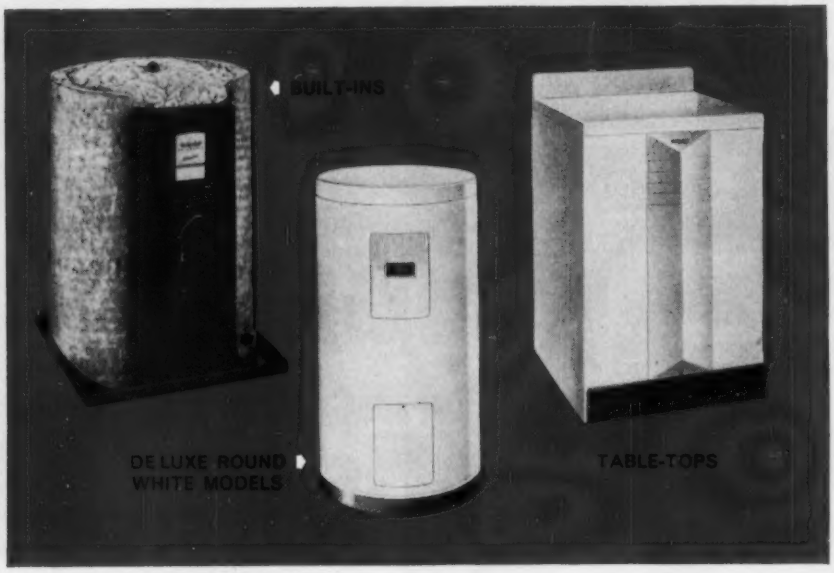
342 Madison Ave., New York 17, N.Y.

THE HOLOPHANE CO., LTD., 410 KIPLING AVE. SO., TORONTO 14, ONTARIO

For Better Lighting Holophane ... *Be Specific*

Hotpoint ELECTRIC WATER HEATERS





...a complete line that helps you

BALANCE LOADS AND BUILD SUSTAINED REVENUE!

Now that Hotpoint offers a complete new promotional Silver Line of round Water Heaters, it's easier than ever for you to add load-balancing, revenue-building Hotpoint Electric Water Heaters to your lines. There's a size and style for *every* need, *every* budget. And their tremendous *pre-sold* popularity is proved by the fact that they are the first choice in over 1,500,000 American homes!

Ask your Hotpoint Distributor for complete details on how you can put this established preference to work for you. He will be happy to help you build assured revenue for today and the future—with Hotpoint Automatic Electric Water Heaters!

Hotpoint Electric Water Heaters are Designed to Sell . . . Built to Last!

- **Easiest to Install** . . . no tricky hook-ups, no long pipe runs, no special tools or skills needed.
- **No Service Problems** . . . only 3 out of every 1,000 have ever needed servicing of any kind!
- **Dependability Through Experience** . . . ⅓ of all Electric Water Heaters ever built have been built by Hotpoint!
- **Calrod® Magic Circle® Heating Units** . . . grip outside of tank with 200 pound pressure for more efficient heat transmission.
- **Automatic Thermostats** . . . mounted directly on tank for sensitive, accurate temperature control.
- **Finest Fibre Insulation** . . . permits storage of hot water for 3 days without heating.

PLUS

Copper Hot Water Trap • "Hot-Dip" Galvanized Steel Tank • Cold Water Baffle • Listed by Underwriters' Laboratories, Inc. • Full Hotpoint Warranty • Quick-Recovery Super-Speed Models and Cement-Lined Perma-Stone Models also available.

LIVE BETTER ELECTRICALLY

Again, Hotpoint looks at Tomorrow, Today!

Water Heaters • Dishwashers • Disposalls® • Electric Ranges • Refrigerators • Food Freezers • Air Conditioners • Automatic Washers • Clothes Dryers • Customline • Television

HOTPOINT CO. (A Division of General Electric Company), CHICAGO 44

NEWS-SCOPE

FUTURE NEWS ▶ **Price of copper is stiffening up.** With any kind of a business spurt in the fourth quarter, the price could climb back to 30¢ a lb (custom smelters copper now selling around 27¢). Aluminum prices should hold around present levels (26¢ a lb).

Steam power plant construction costs are up about 5½%, according to initial tally of statistics utilities have supplied for EW's forthcoming Tenth Steam Station Cost Survey. Final results will appear in the October 7 issue.

LATE NEWS ▶ **Two giant thermal plants, larger than any now in existence,** are slated for construction by Ontario Hydro. The 1,800-Mw plants would each cost about $250 million and will be built on Lake Ontario in Toronto and in nearby Hamilton. The Toronto plant is scheduled for 1961 operation.

New opposition to Arnold Jones' nomination to a TVA board vacancy has dimmed chances that the appointment will be acted on before Congress adjourns. The Senate Public Works Committee, at last week's hearings, received a petition from 14 Southern congressmen asking the committee not to act on the nomination at this time. In addition, Tennessee's Gov Frank Clement has sent in a late request to appear before the committee (see page 80).

Kansas City Power & Light's strike continues as EW goes to press. It began on Monday morning (Aug 26) when about 2,000 employee members of IBEW walked off their jobs. Union is asking for an 8% wage increase while the company has made a 5% offer. No other issues are under consideration.

Bonneville Power Administration may have to curtail interruptible power supplies to industrial customers because of the low flow of the Columbia River. Last month, flow was only 77% of normal.

Florida Power & Light is ordered to cut rates to bring rate of return to 6.98%. The reduction will range from 2% to 22% and will trim earnings by $4,725,000. Ordered by the state's PUC, the rate cut will affect about 600,000 customers.

The Niagara project hits another snag as officials from three upstate New York towns ask FPC to hold public hearings before granting a license to New York Power Authority. The officials object to certain construction plans. NYPA seeks to skip the hearings to speed the start of the project. . . . Meanwhile, Vermont, as a neighboring state, has asked NYPA for an allocation of Niagara power, being eligible for it under the new law.

Congratulations . . . Ohio Edison advances Otto Brunenmeister, Jr, from comptroller to a vice presidential post. E. A. Ladd assumes the comptroller's slot . . . Alfred Gruhl is elected a vice president of Wisconsin Michigan Power and Wisconsin Natural Gas, subsidiaries of Wisconsin Electric Power Co.

ELECTRICAL WEEK

A TWO-MINUTE

ECONOMICS ▶ **There's no recession in sight for electric utilities; business will boom.** That's the word that EW's hard-working statistics department comes up with after running down hundreds of figures and punching out yards of adding-machine tape. Although Gross National Product and industrial production for 1957-1958 show "more temperate" gains, the temporary slowdown will affect utilities the least. More specifics are delineated in EW's annual industry forecast which begins on p 91.

WASHINGTON ▶ **Will Arnold Jones be appointed to a TVA directorship?** That depends upon what action a Senate Public Works committee takes. The personalities, possibilities, and legislative intricacies involved in filling the vacant directorships are spelled out on p 80.

EVENTS ▶ **Advance hurricane predictions now are being made** by U. S. Weather Bureau, but much remains to be learned before they will be "100% perfect," says a weather expert on p 76 . . . Next year's National Electrical Week promises to eclipse its three forerunners (p 79) . . . A boom in uranium, iron, and steel industries, plus agricultural potential, stimulates a $1-billion Snowy Mountain power project in Australia (p 82).

CONSTRUCTION ▶ **An impervious curtain made of a European design of piling** has helped Pacific Power & Light cut costs at Swift Dam. Bedrock is 200 ft below this huge earthfill dam. To scoop out 200 ft of overburden for an ordinary barrier would have been expensive. The special piles (which interlock to form concrete cells) enabled PP&L to scoop out 100 ft of overburden then drive the piling 90 ft to bedrock. A concrete extension wall then was poured on top of this to prevent seepage (p 88).

SYSTEM ENGINEERING ▶ **You can enhance generating economics** by learning how interconnections affect your expansion needs. Three General Electric experts say adequate interties can cut expansion costs about 15%. But what interconnection capacity should you have to achieve that saving? "Equal to the size of the largest unit in the combined system," they say. Economic generator sizes, they continue, range from 12% to 14% of sytsem capacity, assuming a 400-Mw load, but are smaller for larger systems (p 84).

Is it better to ground wye-connected capacitor banks or let them float? Both practices have merit, writes a Line Material Industries author. But the grounded bank is easier to fuse, and eliminates undue voltage variations, feedback, and phase reversal. Although the grounded bank sometimes is avoided to preserve good reception on nearby communications systems, interference in urban areas isn't the bugaboo today that it once was (p 90).

PREVIEW OF THIS WEEK'S ELECTRICAL WORLD

GENERATION ▶ **More efficient maintenance at Duquesne Light's Brunot Island station** is the benefit achieved by the purchase of a self-propelled hydraulic crane for small lifting jobs (p 108).

DISTRIBUTION ▶ **For faster pavement-busting, Kansas City P&L now uses two machines:** One drives a ram into the paving pneumatically; the other works hydraulically. The first is a little faster but requires an air compressor to be towed to the job. The second is self-contained. Its mobility and cost offset its slightly slower working speed (p 112).

Detailed models (to one-eighth scale) of pole-top construction have speeded work for Western Massachusetts Electric Co during conversion of some 4-kv lines to 13 kv. The models were developed to overcome problems of instructing crews (p 114).

METERING ▶ **It only takes 5 min per meter to check all ranges of long-test ammeters** on a special table designed by Houston Lighting & Power Co and described on p 116.

HEATING & COOLING ▶ **Monangahela Power is selling electric house heating despite** (1) lower-than-average spending money of its area customers (2) stiff competition of natural gas. In 20 months, the utility has raised the number of electrically heated houses from 11 to 250, with the outlook growing brighter daily. Here's how the company fought sagging kwhr consumption in its area (p 122).

PEOPLE ▶ **Vice President George F. Foley** of Florida Power Corp has been elected vice president, secretary, treasurer, and a member of the utility's board of directors . . . **Edward G. Twohey** is a new vice president of Narragansett Electric Co . . . **J. Robert Welsh**, president of Southwestern Gas & Electric Co, has been named president of Southwest Atomic Energy Associates (p 184).

FINANCING ▶ **Electric utility financing has been unusually heavy this year.** In the first seven months, utilities floated $1.4 billion in new securities—as much as for all of 1956. Next two months will see even heavier financing: over $620 million scheduled, says Irving Trust Co (p 176).

MANUFACTURERS ▶ **Watch for Reynolds Metals Co to reveal a 5005 aluminum alloy** overhead conductor which has high strength, is all-aluminum, and uses existing connection devices. EW's exclusive story is on p 164.

NEW EQUIPMENT ▶ **A new high-voltage potential transformer** in classes from 92 to 161 kv is small and light . . . Compression connectors with "good resistance to thermal and galvanic action" involving aluminum are now available . . . Network protectors now come with Class H insulation as optional feature (p 126).

ENGINEERING TRENDS

Irradiated polythene is being used to insulate small coaxial cables in Great Britain. Its use greatly reduces deformation of the core during soldering. Power factor is slightly increased but other electrical characteristics are virtually unchanged.

Remote-controlled examination of radioactive material has been greatly facilitated with newly developed television microscope. Equipment consists of an industrial television camera and the monitor linked to a microscope under which radioactive specimens are examined. Sample under examination can be changed by remote control.

Pump storage capacity amounting to 10-15% of total system capacity might be used on a system without other hydro capacity.

Fissionable material can be incorporated as oxides in glass fibers to make nuclear reactor fuels having unique properties. The fiber structure offers a large heat-transfer surface. Stability of the fibers may be greater than that of metallic fuel elements.

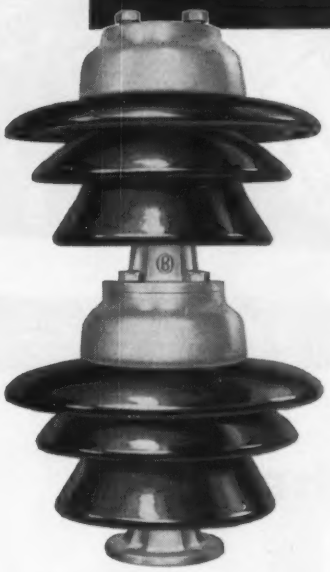
Transmitting short trains of high-frequency mechanical waves into a specimen and determinating their velocity of propagation has enabled Bell Telephone Laboratory scientists to accurately measure elastic moduli of small specimen of a wide range of materials.

Two years operating experience with hypochlorination for condenser cooling water sluice control has proven effective. The sodium hypochlorite method which replaced chlorine gas previously used was safer and more economical.

2½ million kwhr is promised from 1.2-Mw solar energy power plant being built in Russia. Steam at 450 psi will be produced in a large solar boiler.

FROM EDITORS IN THE FIELD

Concept of load allocation by equal incremental costs is being used actively by most western utilities for computing loading schedules. Each can cite substantial fuel cost savings as a result. Among those attaining highest precision of the method are two companies, one in California, the other in Arizona. Both will use dispatching equipment which automatically computes optimum load allocations and loads individual machines directly, using telemetering channels between power plants and dispatchers' office.



for the facts that prove the value of O-B station-type insulators

Station-type insulators are standardized. That makes them all alike--some think!

Your own experience doesn't bear this out, we'll wager. Some last longer than others. Since they all cost about the same, this simply means some are worth more than others. Standards don't tell *all the story.*

O-B can make some fancy claims about its insulators, but there's a better way of bringing the story home to you. It would be unusual if there weren't hundreds, maybe thousands, of O-B station insulators on your system. Look-up the record--*your record*--of *our* product.

The facts are in your file, right now, in your own language, on your own terms. They will prove the point that no standard applies to getting your money's worth!

And you'll find it pays to specify O-B insulation for your stations.

OHIO BRASS COMPANY MANSFIELD, OHIO

Ohio Brass

4797-H

No "stuffed shirts" here!

Nor much sympathy either for "red tape" or routine handling of emergency orders.

From experience, Circle distributors know that when they need fast action on an order, they can get to anyone from the president on down . . . and receive immediate attention.

Happily, such emergencies don't occur too often for the simple reason that the ample stocks of Circle distributors are strongly supported by well-stocked nearby supply centers.

Thus any emergency order, as a rule, need go no further than the local warehouse.

All-out service . . . broad line . . . ample stocks: these are why more and more contractors agree that working through a Circle distributor is their best assurance of adequate, available supplies.

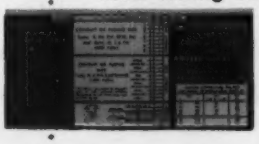
Circle Wire and Cable Corp., 5500 Maspeth Avenue, Maspeth, N. Y.

CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N.Y. SALES OFFICES: In all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES • NEOPRENE SHEATHED CABLES

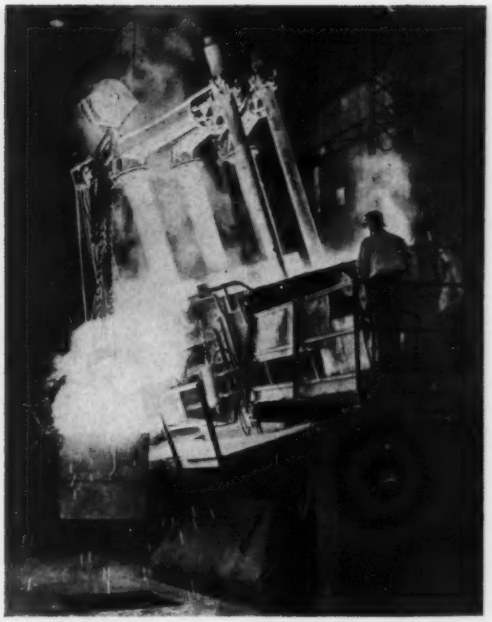
New Wiring Calculator — FREE!



Send today for this useful wiring aid. Gives conduit sizes, amperage capacities, and motor running data. Write Dept. B-9

REGULATORS

FOR ALL TYPES OF ELECTRIC ARC FURNACES & POWER GENERATING EQUIPMENT



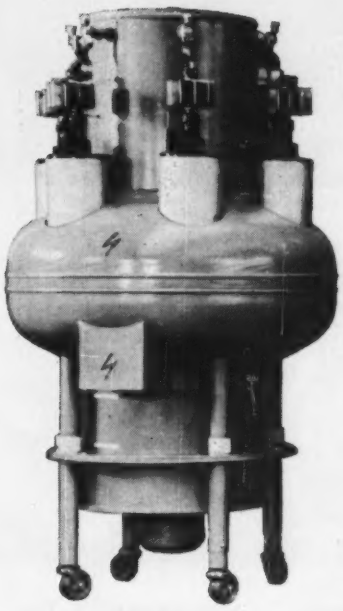
High speed "Simplex" or "Transex" systems of electro-mechanical or of magnetic amplifier design.

Ultra high speed "HF" system of electro-hydraulic design.

High speed of response, rugged and simple construction allows trouble-free and reliable operation, a high degree of uniformity and purity of the refined product.

Low installation and maintenance cost. Complete installations or components only furnished, depending on specific requirements.

Sécheron
GENÈVE



Type A615 six anode unit — 1500 A max. rated current up to 850 VDC

pumpless, air-cooled steel tank

RECTIFIERS

Available in nominal currents from 400 to 1500 A for each unit. Six anode pumpless steel tanks, forced air cooled construction. Non-aging electrode inlets with metal-glass-ceramic "welds" unaltered by temperature changes insure unlimited permanent vacuum. Mercury vapor and rare gas filling allowing quick start-up under full load. Small space requirements, simple erection, low maintenance costs, low initial installation costs. Units can be connected in series or parallel for any output required. Complete installations can be supplied including AC and DC switchgear, 6-phase transformers, voltage regulation and unit supervisory controls.

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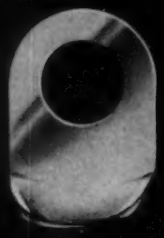
AMP

COMPRESSION for the



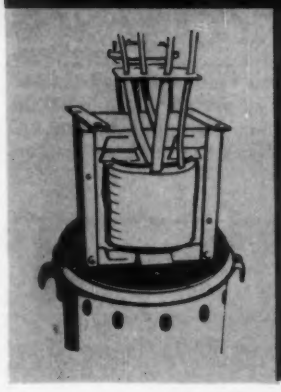
ALL TERMINALS SHOWN ACTUAL SIZE

SOLISTRAND®
22-600 MCM AWG

Ampli-Bond®
8-4/0 AWG

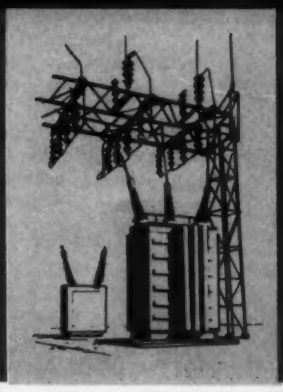
DIAMOND GRIP
26-10 AWG

PRE-INSULATED DIAMOND GRIP
26-10 AWG



SOLISTRAND Butt and Parallel Connectors for innercoil connection to leads. SOLISTRAND Terminals on outside leads of transformers.

PRE-INSULATED DIAMOND GRIP and DIAMOND GRIP Terminals and Connectors for switchgear panel wiring in generator plants and sub-stations.



SOLISTRAND and AMPLI-BOND Terminals and Connectors for construction and maintenance of generator plants and substations.

PRE-INSULATED DIAMOND GRIP and SOLISTRAND Terminals and Connectors for street and traffic light installation and maintenance.

TERMINAL PRODUCTS UTILITY INDUSTRY...

AMP's diversified lines of terminal and connector products . . . and matched precision-engineered application tooling . . . have been part of the utility industry's components story, in many ways, for many years. These products have been designed for the exacting requirements of the electrical industry in general, and a predominant number of original equipment items depend on the AMP method of termination and connection for service reliability.

AMP's diversified lines of terminal and connector products include:

SOLISTRAND®—of one-piece construction, for application to stranded, solid or irregularly shaped conductors.

Ampli-BOND®—provide full insulation support for large wire sizes. They are bonded and reinforced to prevent relaxation of cable support.

DIAMOND GRIP—non-insulated, but having metallic sheath to provide full circumferential support to cable. Excellent for applications where resistance to vibration is a factor.

PRE-INSULATED DIAMOND GRIP—insulated with tough plastic that won't come off . . . it's bonded. Affords optimum performance under vibration.

Some typical applications of these A-MP products are shown below.

AMP's continuing programs of research and development are increasing the potential of newer products to speed operations, reduce costs, and improve reliability for all phases of utility activity.

A-MP products, when required for maintenance and repair needs, are available in the U. S. A. through American Pamcor Inc. api AMERICAN PAMCOR INC.

For additional information write to:

AMP INCORPORATED

General Offices:

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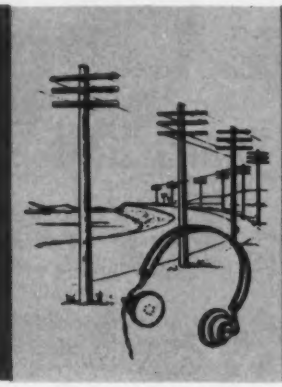
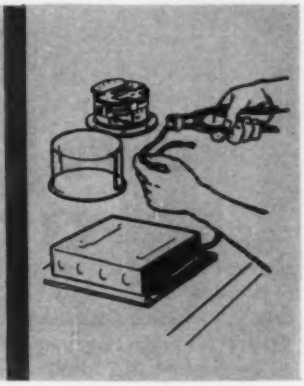
Distributor in Japan: Oriental Terminal Products Co., Ltd., Tokyo, Japan

PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP, and SOLISTRAND types find extensive usage in truck and car fleet maintenance.



PRE-INSULATED DIAMOND GRIP Terminals and Connectors for communications equipment.

PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP and SOLISTRAND types for appliance repairs.



PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP and SOLISTRAND types for meter repairs.

US RUBBER EXPANSION JOINTS

Drinking heavily for 30 years and still healthy

This U. S. Rubber Expansion Joint has been drinking brackish sea water (at temperatures from 50 to 100 degrees F.) for three decades. It and another identical 36" U. S. Rubber Expansion Joint are at work on the intake lines of #5 condenser at the Reeves Avenue Power Station of the Virginia Electric & Power Company in Norfolk, Virginia, where they compensate for the vibration, expansion and contraction caused by pumping the sea water. These are two of the first rubber expansion joints ever installed *anywhere*.

U. S. Rubber Expansion Joints are the economical, flexible connections that are used in all kinds of pipe lines to take care of misalignment, vibration, expansion and contraction, and noise transmission. They have no moving parts to wear or bind. They can be installed on both new and old piping and equipment. They are available (along with expert engineering service) at any of our 28 District Sales Offices, at selected distributors or write us at Rockefeller Center, N. Y. 20, N. Y. In Canada, Dominion Rubber Co., Ltd.

US RUBBER **Mechanical Goods Division**

United States Rubber

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new! always RIGHT FOR ANY BI-METAL OR Al TO Al CONNECTION
WEAVER
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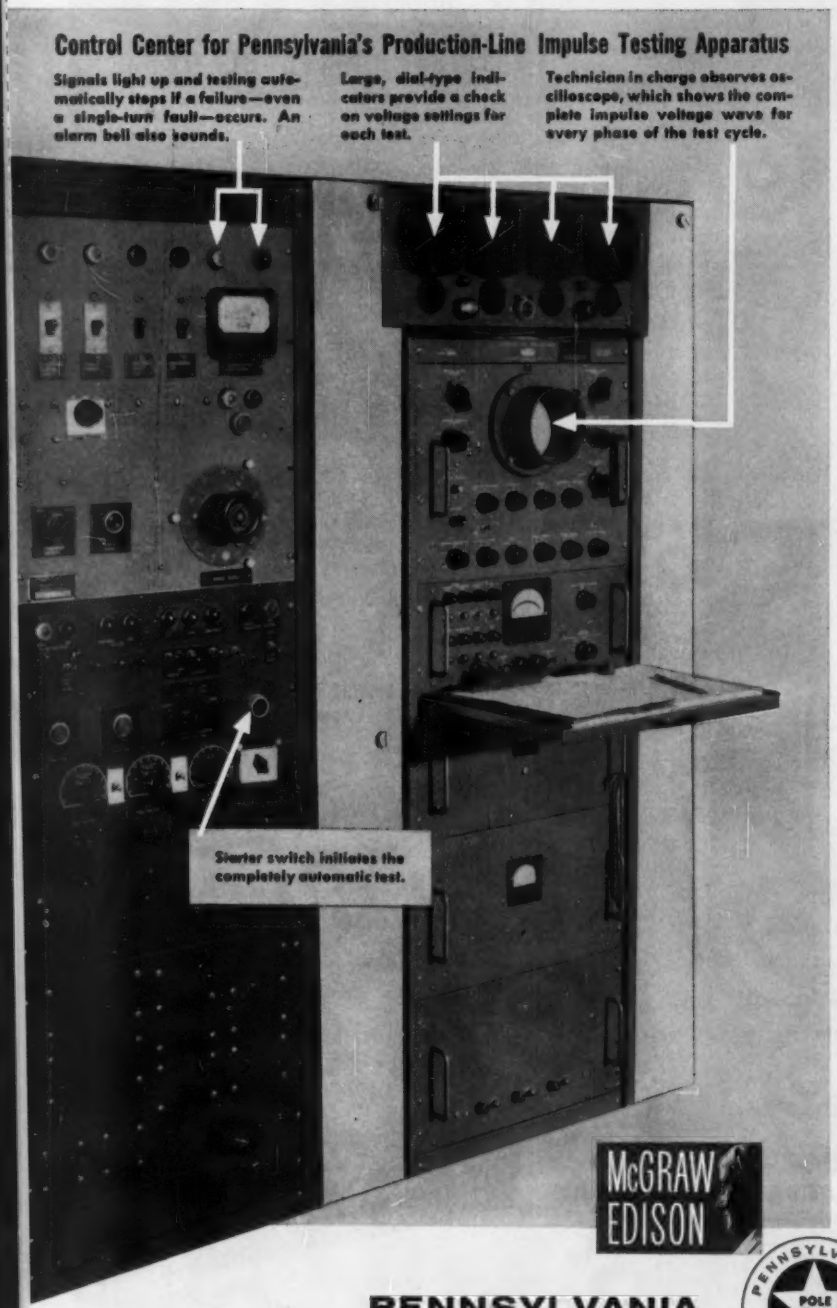
ni-cad* COATED!
The weatherproof NICAD coating (over a hi-strength aluminum body) keeps any bi-metal connection troublefree, come what may: Heat, cold, salt, alkali, you name it!
They eliminate trouble caused by... (1) Oxidation of Cu against Al; (2) Unequal expansion or contraction of lines and clamps during severe temperature changes. Contacts stay tight—no arcs.
NO SEPARATE INSERTS TO CATCH MOISTURE AND CAUSE CORROSION! NO SOLDERED JOINTS!
Permanent Low-Resistance Connections
WRITE FOR SAMPLES FOR TESTING
Five sizes now available (NI-CAD coated or non-coated) to cover all requirements.
*Extremely heavy coating of cadmium and other corrosion resistant elements
2110 HOWARD ST. • ST. LOUIS 6, MO. • CEntral 1-8100
J. A. WEAVER Company

A Report on IMPULSE TESTING of *Pole Star* DISTRIBUTION TRANSFORMERS


Control Center for Pennsylvania's Production-Line Impulse Testing Apparatus
Signals light up and testing automatically stops if a failure—even a single-turn fault—occurs. An alarm bell also sounds.
Large, dial-type indicators provide a check on voltage settings for each test.
Technician in charge observes oscilloscope, which shows the complete impulse voltage wave for every phase of the test cycle.
Starter switch initiates the completely automatic test.
McGRAW EDISON

- What It Is . . .
- What It Tests . . .
- What It Accomplishes . . .

WHAT UNITS ARE TESTED

All Pole Star distribution transformers from 3 through 167 kva with high voltage ratings through the 18-kv class are impulse tested. The special apparatus used is an integral part of the production line at Pennsylvania Transformer's Canonsburg plant. Both high voltage and low voltage windings are tested.

NATURE AND MAGNITUDE OF THE IMPULSE VOLTAGE

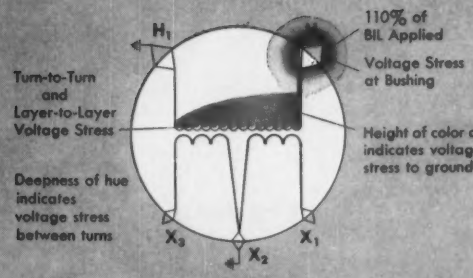
Test voltages applied to the high voltage windings are 10% above the basic impulse level (BIL) values listed in ASA Standards C57.12. The impulse voltage—which is basically the same as the sudden surge that occurs as the result of lightning—rises to crest value in just 1½ microseconds (millionths of a second) and declines to one-half crest value in 40 microseconds.

Because of the low impedance of low voltage windings, a wave of shorter duration is used to simulate more closely the surge effects of natural lightning. Low voltage windings thus are tested at a standard voltage value by applying an impulse voltage with a wave shape of ¾ x 1½ microseconds across one-half of the winding. This induces an equal voltage in the other half, so that twice the applied voltage appears across the total low voltage winding. Simultaneously, an impulse voltage of full BIL value is induced in the high voltage winding.

HOW THE TESTS ARE CONDUCTED

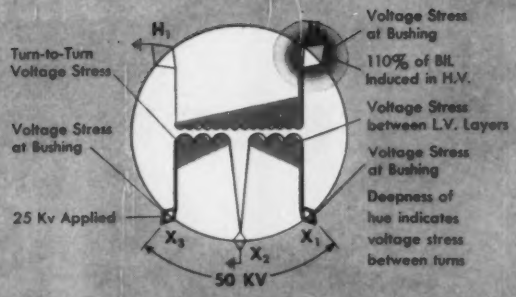
So that the transformer itself will be subjected to the full force of the impulse voltage, both conventional and protected Pole Stars are impulse tested *without arresters* or with arresters rendered inoperative. The tests, which are fully automatic, are conducted in the following manner, with the tank

PENNSYLVANIA POLE STAR TRANSFORMERS DISTRIBUTION



TESTING OF HIGH VOLTAGE WINDINGS

Depicted here is one step in the testing of high voltage windings. In the second step, impulse voltage is applied to H_1 while H_2 is grounded. Test voltages are 10% above the basic impulse levels.



TESTING OF LOW VOLTAGE WINDINGS

Applying impulse voltage in one-half of the low voltage winding induces an equal voltage in the other half. The test also induces an impulse voltage of full BIL value in the high voltage winding.

grounded through a shunt impedance.

For the h.v. winding test, impulse voltage is applied to H_1 while H_2 and X_2 terminals are grounded to the tank. The procedure then is reversed for tests on H_2 while H_1 is grounded.

For the l.v. winding test, impulse voltage is applied to X_1 while H_2 is grounded and a voltage limiting impedance to ground is connected to H_1. The X_2 terminal is grounded and X_3 is ungrounded.

In every phase of the test cycle, the technician in charge observes an oscilloscope that shows the complete impulse voltage wave. Also, an electronic relay is connected so that any failure—even one so minute as a single-turn fault—will automatically stop the testing to indicate the test in which failure occurred.

HOW MUCH OF THE TRANSFORMER IS ACTUALLY TESTED

Traveling at the speed of light, the impulse voltage stresses the turn-to-turn, layer and section-to-section insulation, as well as all insulation to grounded parts, such as the core, core frame and tank. In addition, the impulse voltage fully tests all bushings, leads, tap changers and other accessories. Only transformers that are properly manufactured of highest quality, defect-free material can pass this rigorous test.

WHAT MORE THAN ONE YEAR'S TESTING HAS ACCOMPLISHED

Before production-line impulse testing was initiated at Pennsylvania Transformer, basically the same tests were conducted on Pole Star models and stock units selected at random. This method of testing helped prove the soundness of the Pole Star design, which was further demonstrated throughout the years by Pole Stars' reputation for long-term, trouble-free service.

More than a year-and-a-half of production-line impulse testing, however, has served to make this high quality transformer even *better*. The chief contribution of full-scale impulse testing has been the detection of occasional minor discrepancies—chiefly in component parts but also, from time to time, in certain manufacturing details involving the human element. While these errors are so slight that the units in which they occur have passed *all standard ASA tests* prior to impulse testing, they do represent sources of potential trouble—trouble which may never occur, but which might, in some cases, develop within hours after a transformer is installed.

Of particular significance so far as Pole Star design and construction are concerned is the fact that, during the first full year of testing, actual winding failures occurred in only *one-half of one percent* of the many thousands of transformers tested.

When discovered, *all* causes of failure during impulse testing are attacked with skill and determination by the Pennsylvania engineering and production staffs. Thus far the resulting changes in components (some have been completely redesigned) and improvements in methods have achieved remarkable results. For example, the percentage of rejects for all causes during the last half of the first full year of testing (1.55%) was *over 50% less than for the first six months of the year*. While the rate of percentage reduction may be slower henceforth, production-line impulse testing will continue to safeguard quality, and will be a valuable tool in the hands of production and engineering personnel.

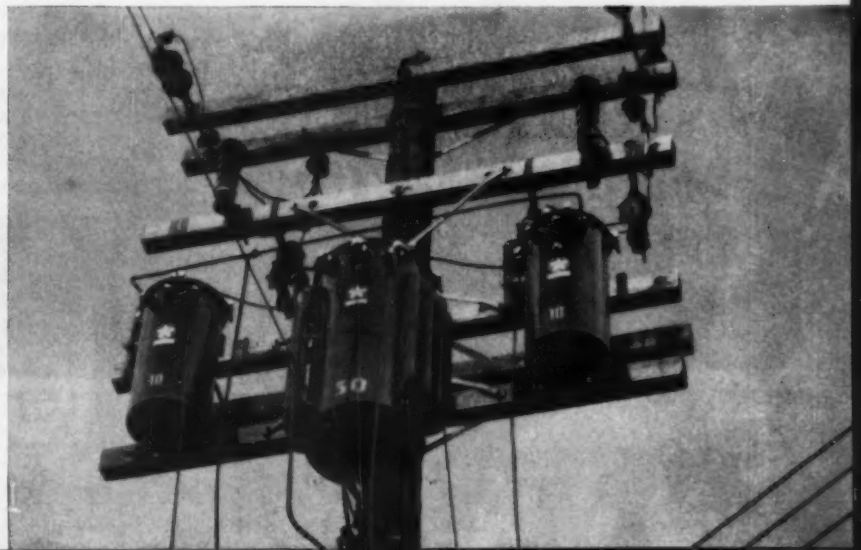
WHAT IT ALL MEANS TO YOU, THE PURCHASER

Even longer average service life than in the past is the principal benefit to be gained by the purchaser of Pole Star distribution transformers as a result of production-line impulse testing. Of course, longer service life means less maintenance, fewer replacements, lower costs—and better service to customers.

Impulse testing provides a highly efficient and constant check on production methods, component parts, and design effectiveness. Call it "quality control" or by any other name—the net result is that the purchaser *always* gets the outstanding quality and efficiency that are inherent in the Pole Star design. There can be no doubt, too, that the knowledge and experience gained from impulse testing will light the way to an even finer Pole Star of the future.

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY
Canonsburg, Pa.

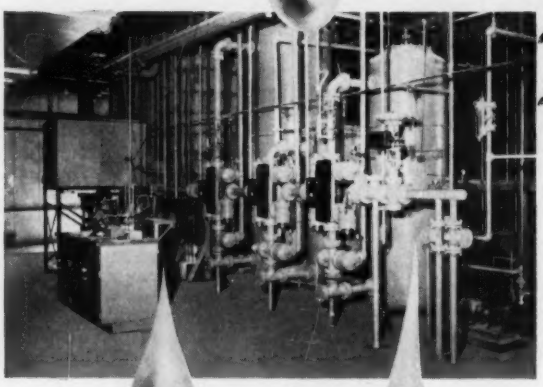
TRANSFORMERS



INFILCO

DEMINERALIZATION EQUIPMENT

.....engineered to meet your requirements



MAXIMUM RELIABILITY

HIGHEST QUALITY WATER

Check some of these installations. They are representative of INFILCO's advanced engineering and development in providing water suitable for modern industrial process and power requirements.

Crystal Ice and Cold Storage Company... Phoenix, Ariz.
International Paper Company... Panama City, Fla.
Helene Curtis Industries... Chicago, Ill.
Western Electric Company... Chicago, Ill.
National Petro-Chemicals Corp.... Tuscola, Ill.
Hytron Radio & Electronics Company... Newburyport, Mass.
Raytheon Manufacturing Company... Quincy, Mass.
Hytron Radio & Electronics Company... Kalamazoo, Mich.
Minnesota & Ontario Paper Company... Internat'l Falls, Minn.
Great Northern Oil Company... Roseport, Minn.
International Paper Company... Natchez, Miss.
General Tire & Rubber Company... Ashtabula, Ohio
Turnsted Division, General Motors Corp.... Columbus, Ohio
Security Engineering Div. Dresser Industries... Dallas, Texas

It will pay you to investigate. Write today for Bulletin 1960-C. Inquiries are invited on all water and waste treatment problems, including boiler feed water makeup, process water clarification and purification, waste pollution control, material reclamation and related needs.

INFILCO

INCORPORATED

General Offices • Tucson, Arizona • P. O. Box 5033

Field offices throughout the United States and in foreign countries

THE ONLY COMPANY impartially offering equipment for ALL types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment. 5740-12

Simplex Wire & Cable Company's new 1,400,000 volt impulse generator — the first of its kind to be installed in North America — represents just one aspect of research at Simplex. Simplex scientists and engineers originated the process of vulcanizing portable rubber cords and cables in a lead mold. Simplex developed the first heavy-duty portable electrical cable — Simplex TIREX. The first truly moisture-resistant rubber insulation was the outcome of a commercially acceptable method of deproteinization developed by Simplex. Simplex designed the first interlocked armored cable for underground service — Simplex CONDEX. And now — Simplex C-L-X — the portable, corrugated metallic duct WITH SEALED-IN CABLE. **SIMPLEX WIRE & CABLE CO.,** Cambridge, Massachusetts and Newington, New Hampshire.

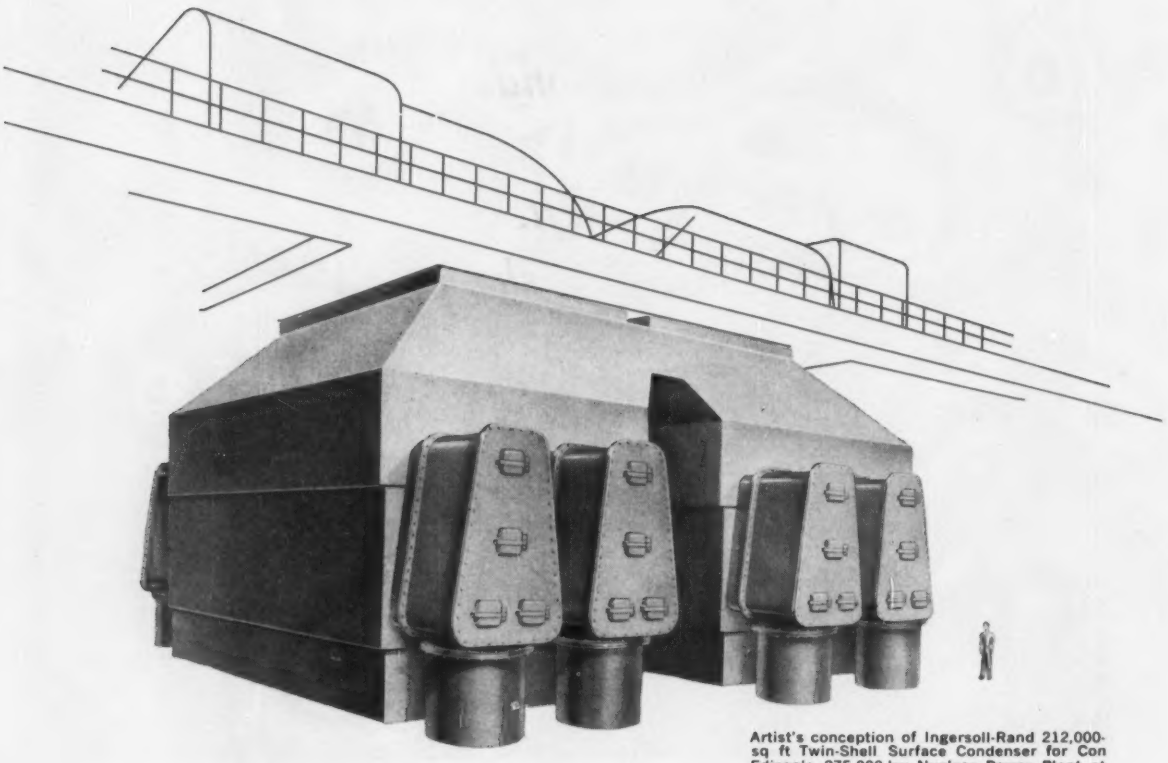
Simplex

LIVE BETTER ELECTRICALLY

Highest quality cables for: Mining • Power & Lighting • Construction • Transportation • Communications • Signalling

Ingersoll-Rand Twin-Shell

will serve Con Edison's 275,000-kw



Artist's conception of Ingersoll-Rand 212,000-sq ft Twin-Shell Surface Condenser for Con Edison's 275,000-kw Nuclear Power Plant at Indian Point

I-R Condensers set the pace in meeting all of today's turbine-condenser arrangements

BOTTOM EXHAUST: Regardless of headroom limitations, I-R surface condensers permit most effective utilization of all available under-turbine space. Sketch above, for example, shows a 65,000-sq ft condenser with headroom of only 14 ft 8 in, serving a 135,000-kw bottom-exhaust turbine.

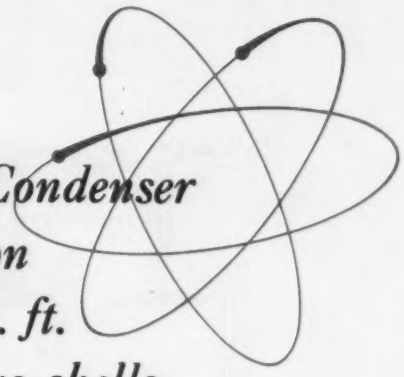
SIDE EXHAUST: Mounted directly on the turbine floor, the twin shells of this I-R condenser are connected directly to the dual side exhausts of a huge, cross-compound steam turbine serving a large mid-western utility. Such a condenser can be arranged for the most economical design proportions without the usual limitations of headroom and floor space.

AXIAL EXHAUST: This advanced-design I-R condenser connects directly to the exhaust of an axial flow exhaust turbine. The result of close cooperation between I-R engineers and the turbine designers, it is another outstanding example of the adaptability of I-R condenser design.

PUMPS • COMPRESSORS • STEAM JETS • CONDENSERS

Surface Condenser

NUCLEAR POWER PLANT



Advanced design I-R Condenser for Indian Point Station will contain 212,000 sq. ft. of cooling surface in two shells

SCHEDULED for completion in 1960, the Indian Point Nuclear Station of Consolidated Edison Company of New York, Inc., will pioneer many inovations in power plant equipment and design.

The I-R twin shell condenser serving the 275,000-kw turbo-generator unit will be the largest on the Con Edison system. The turbine is an 1800-rpm single shaft, double exhaust unit, and the condenser size is comparable to that of a unit serving a conventional 400,000-kw turbine. The two condenser shells will contain almost 180 miles of tubing with a total condensing surface of 212,000 sq ft. The 31,508 tubes will be welded at both ends into silicon-bronze tube sheets. Special hotwell trays will be provided with a total of 24 sampling connections to permit continuous indication of condensate purity.

Ingersoll-Rand will also supply the boiler-feed pumps, circulating pumps and steam-jet ejectors for the history-making Indian Point Station. The three specially-designed boiler-feed pumps will have a capacity of 2425 gpm at 632-psig discharge. And the two huge vertical circulating pumps will each handle 140,000 gallons per minute.

This outstanding installation is further evidence of Ingersoll-Rand's ability to meet *any* surface condenser requirements for any turbine-condenser arrangement. Your I-R engineer will be glad to discuss your power plant problems and help you determine the equipment best suited to your needs.

Ingersoll-Rand

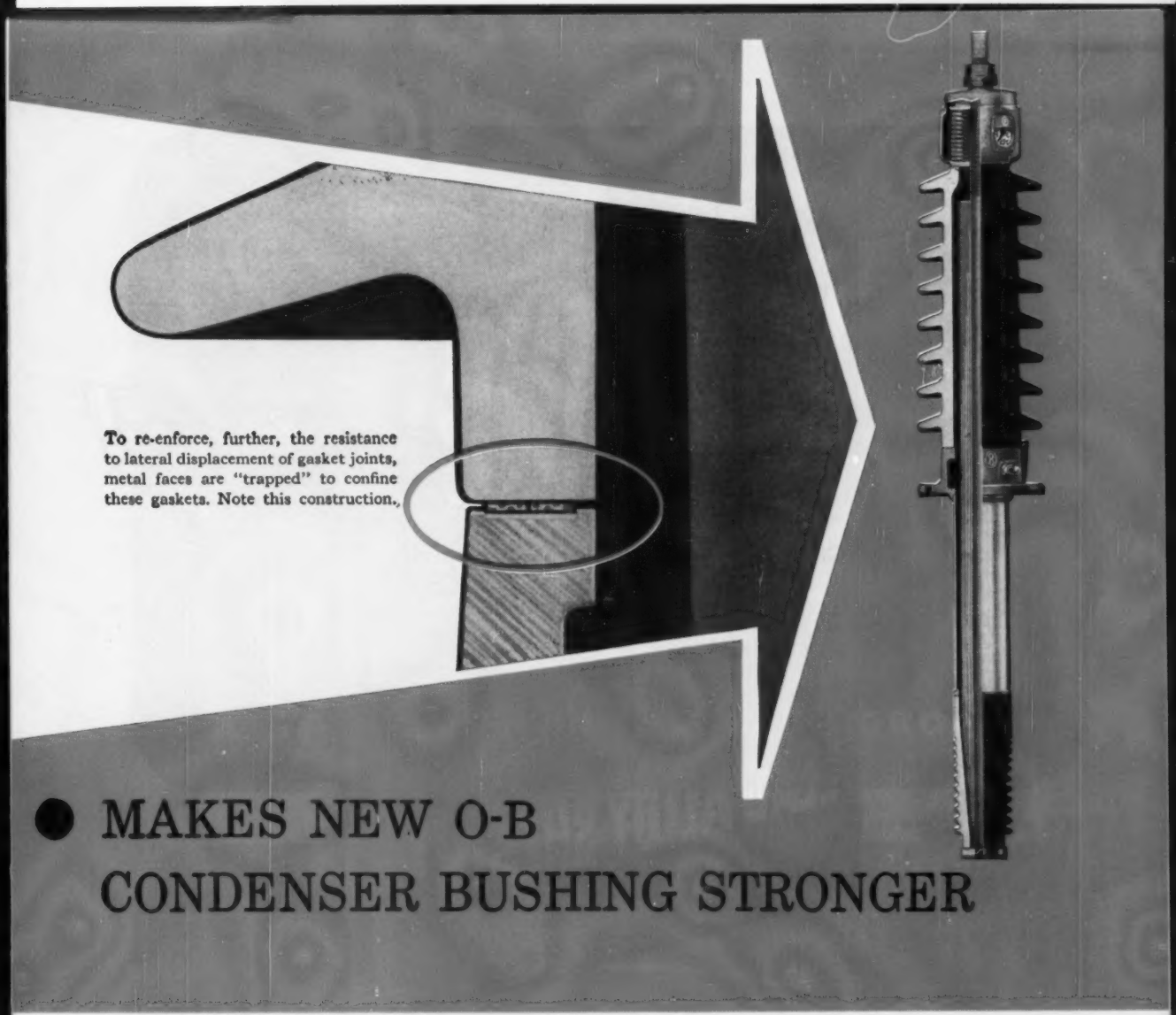
11 Broadway, New York 4, N.Y.

4-599

AIR & ELECTRIC TOOLS • ROCK DRILLS • TURBO-BLOWERS

the right gasket...

Best properties of two dis-similar gasket materials are combined to impart both maximum strength and sealing power at all porcelain-to-metal joints in new O-B bushings.



To re-enforce, further, the resistance to lateral displacement of gasket joints, metal faces are "trapped" to confine these gaskets. Note this construction.

MAKES NEW O-B CONDENSER BUSHING STRONGER

Gaskets are used to seal porcelain-to-metal joints in bushings—*but that's not all.*

These joints are surface-to-surface contacts. Bushings are shipped and handled several times before they end up on a piece of apparatus. Occasionally they get rough treatment. They must also withstand the cantilever strains of circuit breaker operation.

Some gaskets—good as their seal may be—can be "slippery." Others are too soft or weak. These will not resist displacement of adjacent parts under shock.

New O-B condenser bushings meet this problem ingeniously. Cork is, traditionally, the best gasket from a strength standpoint. It's also good, but not quite the best, as a seal. But the best seal isn't strong enough. So we combine them. Two concentric gasket rings are used at every joint; one cork, one a dense and compressive synthetic. Each is specialized. The seal is both strong and tight—stronger and tighter than any one material can provide.

This is typical of the modern design of the industry's most modern bushing, the new O-B condenser type.

With these new bushings on your apparatus, you have a lifetime of good performance stretching ahead. Be sure to get them!

4794-H

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

GET THE INSIDE STORY...

THIS NEW 8-PAGE BOOKLET TELLS WHY **ROEBLING TELLURIUM LEAD ALLOY SHEATH** LASTS LONGER!

90% less creep... 4½ times greater bending life... unusual stability under heat... negligible age-hardening—you've read how Roebling Tellurium Lead Alloy Cable Sheath has all these favorable, life-saving qualities, and more. Now the full story, complete with useful technical data, is told in an illustrated 8-page bulletin that's free for the asking.

Learn how cable maintenance problems can be materially reduced, with savings. Send for your copy of this informative book today!

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Please send me your new Tellurium Lead Alloy Sheath Facts Book.

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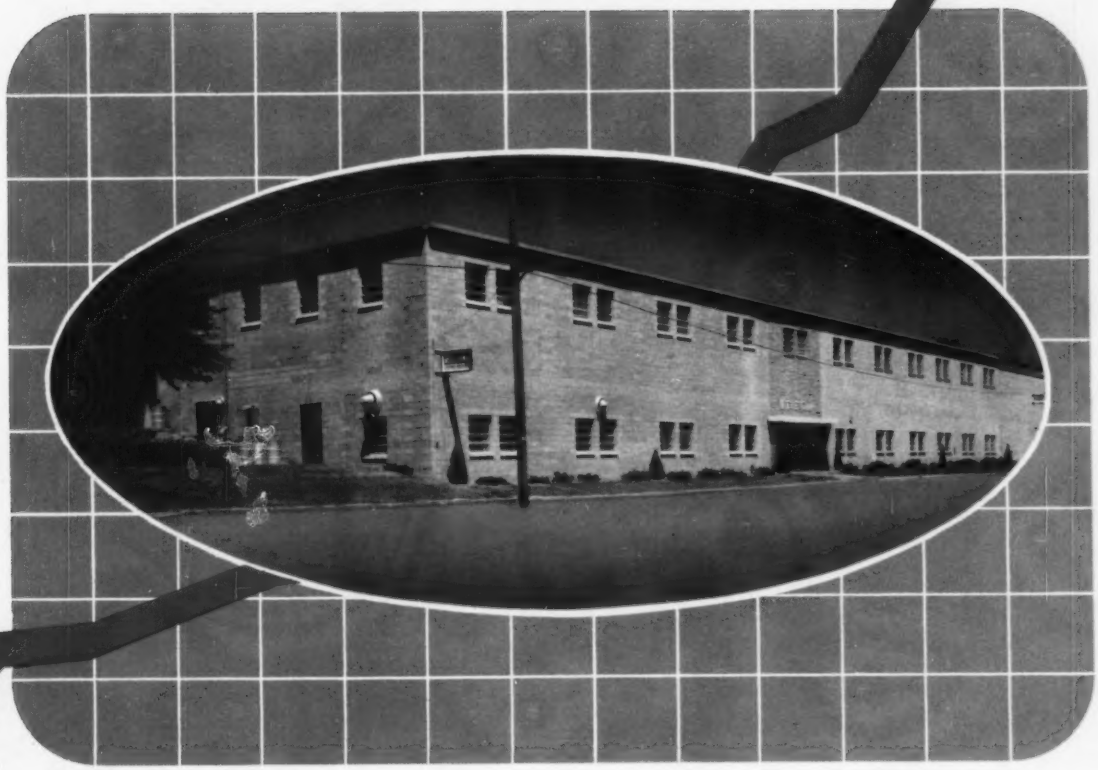
EXPERIENCE + SKILL + EFFORT + SERVICE

= A STORY OF OUTSTANDING GROWTH



RT&E

STEADY GROWTH THROUGH *A DEPENDABLE PRODUCT*

EXPERIENCED PERSONNEL

This year marks 11 years of successful manufacturing of distribution transformers by RT&E Corporation.

In this relatively short period of time, RT&E has enjoyed phenomenal acceptance throughout the entire Utility industry. According to the latest surveys, RT&E now ranks 10th among 23 competitors.

An enviable record such as this is not a "matter of chance" . . . it takes the combined efforts of *Experienced* "PEOPLE", a *Superior* "PRODUCT" and *Modern, Well Equipped* "FACILITIES".

Below are pictured some of the *Experienced* PERSONNEL who together form RT&E's solid background for the design, manufacture, and sale of distribution equipment.

From left to right: E. A. Link, Chief Engineer; G. A. Davey, Secretary; R. D. Nelson, President; G. M. Keenan, Sales Manager; C. W. Shaw, Vice President and Treasurer.

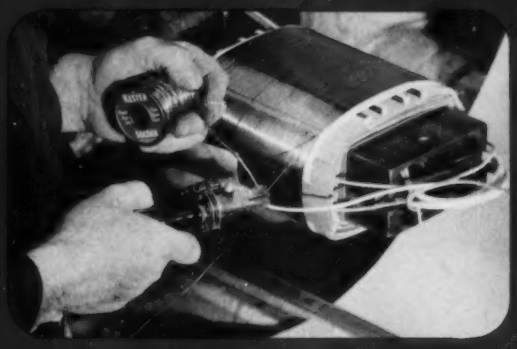
OUTSTANDING ENGINEERING

RT&E's *Superior* Transformer PERFORMANCE does not "just happen" . . . it requires the creative talents of experienced engineers engaged in a never-ending search for better materials and methods.

The prominent position RT&E occupies in the industry today along with the many new developments RT&E has introduced, such as the *Externally* Operated Tap Changer and Dual Voltage Switch, are positive proof of RT&E's success in finding new and better ways of doing a job.

A FEW RT&E FIRSTS IN DESIGN FEATURES

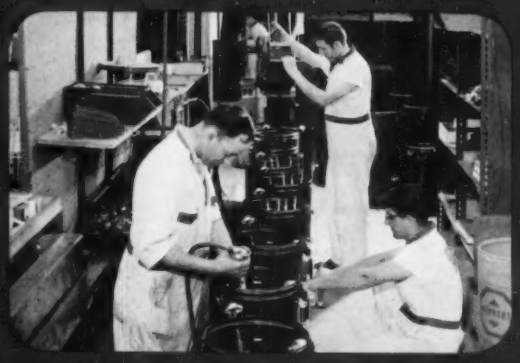
MODERN FACILITIES



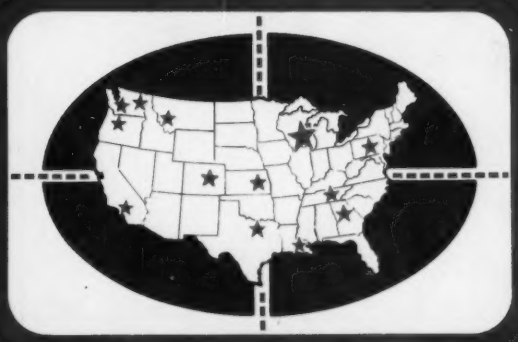
RT&E transformers are produced by highly skilled personnel, using the most Modern EQUIPMENT and TECHNIQUES known.

The entire manufacturing process from coil winding through final assembly uses the most Modern Methods of INSPECTION and QUALITY CONTROL.

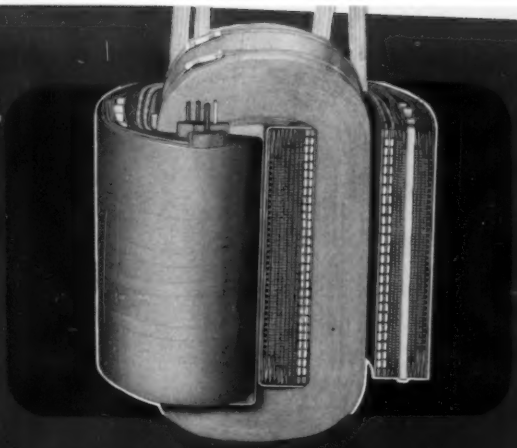
This assures that only those transformers worthy of RT&E's FIVE Year Guarantee reach the customer.



RT&E's modern fire proof plant is located in Waukesha, Wisconsin. The plant combines under one roof efficient manufacturing, storage and office space with facilities for prompt shipment by rail or truck.



The above map shows the conveniently located RT&E warehouses throughout the country which are prepared to fill your requirements quickly and efficiently at all times.

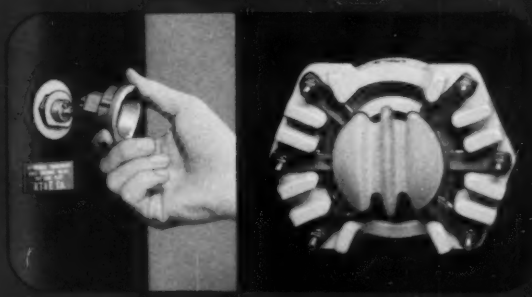


RT&E WOUND CORE

RT&E transformers feature a wound core of single turn laminations with staggered, interleaved butt joints formed from the finest non-aging, high permeability, cold reduced silicon steel. This core, together with the RT&E coil, results in a transformer that has low losses, low regulation and low weight, and is high in impulse strength and overload capacity.

RT&E EXTERNALLY OPERATED TAP CHANGER

This unique RT&E feature eliminates entering tank. Tap position quickly identified and easily changed without disturbing transformer seals.

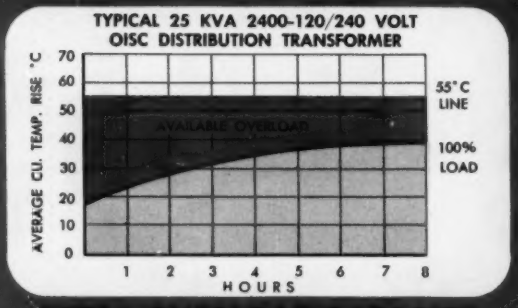


RT&E DUAL VOLTAGE TRANSFORMERS MEAN SAVINGS IN MONEY, TIME, LABOR

You save in stocking requirements . . . one unit can be stocked where it now takes two. You save transformers from obsolescence when system voltage is increased. You save on change-over, cutting both down time and labor time.

Voltage change-over switch is mounted on the inside of the tank, under the oil level. It is fully operable from outside the tank.

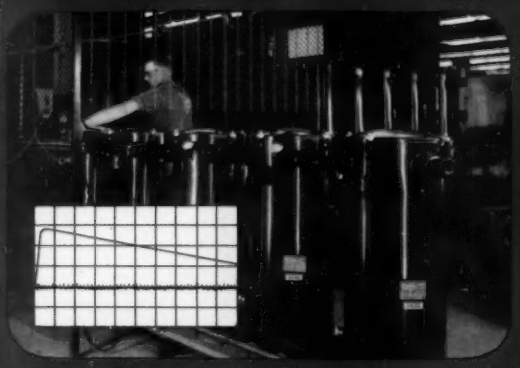
RT&E PROVIDES "PLUS" ADVANTAGES



EXTRA OVERLOAD CAPACITY

All RT&E Transformers are designed to carry approximately 150% load for at least six hours without exceeding NEMA temperature rise limitations. This extra overload capacity is obtained through:

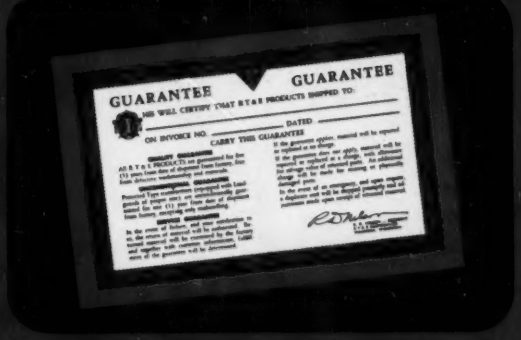
- Low current densities.
- Generous use of copper.
- Ample, well-placed cooling ducts.
- Larger, exposed coil surfaces.



IMPULSE TESTING

High impulse strength in transformers is not attained by accident; it must be considered from the very beginning of design. RT&E transformer design is based on impulse withstand levels approximately 50% in excess of NEMA standards.

Every RT&E Transformer receives an "on the line impulse test" with the most modern equipment and methods. This test insures that the transformer meets NEMA impulse level requirements, rejects those transformers that are not maximum quality. RT&E Transformers have been thoroughly proven in operation in every climate of the United States.



FIVE YEAR GUARANTEE

Only RT&E, among transformer manufacturers, guarantees its products for five full years. This practice is further proof of RT&E dependability.

RT&E DISTRIBUTION TRANSFORMERS
CONVENTIONAL AND PROTECTED STYLES
2400 VOLT THROUGH 14,400 VOLT
3 TO 500 KVA RANGE

RT&E

CORPORATION

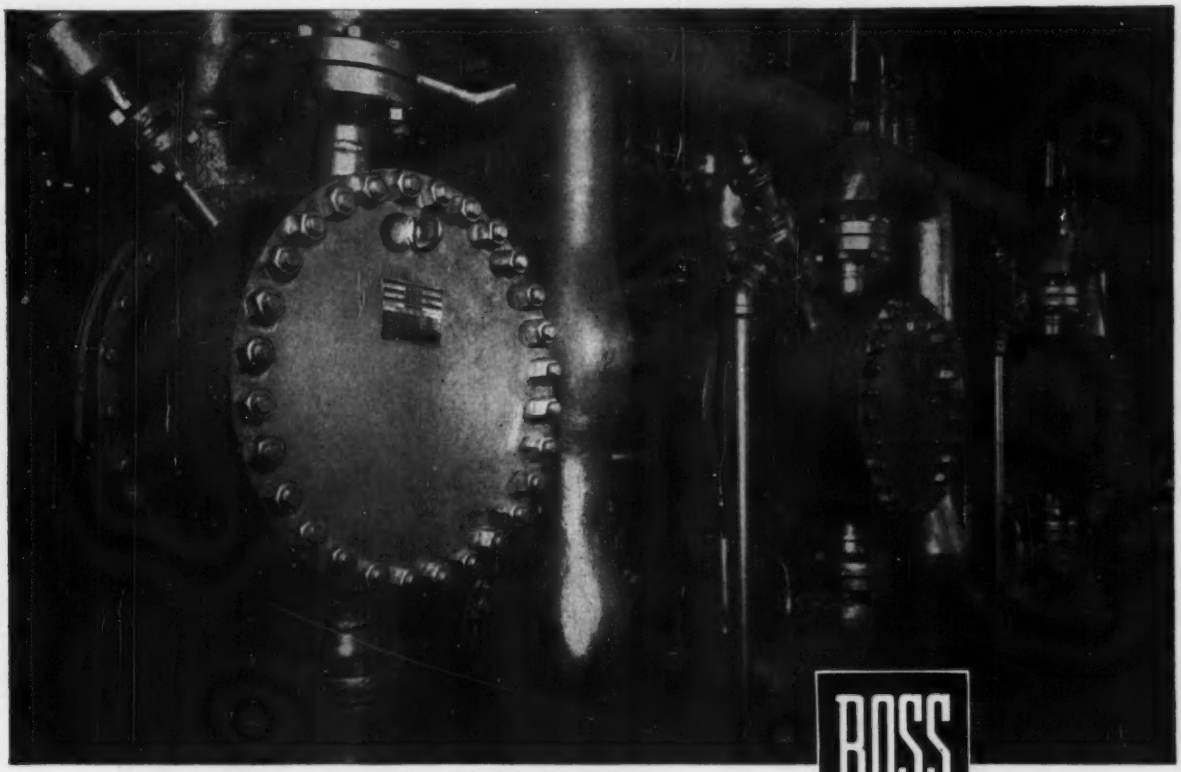
WAUKESHA, WISCONSIN

Equipment designed with tomorrow's load growth in mind.

TERMINALS for AL-CU

INHIBITED with DBPC

IMPULSE TESTED



ROSS

THE ROSS STORY

Special Heat Exchange Equipment for Power Plants

Simply stated, Ross designs and manufactures heat exchangers for virtually all conditions and applications, particularly units of a highly specialized nature, such as high pressure power plant equipment... bleeder heaters and fuel oil heaters, for example.

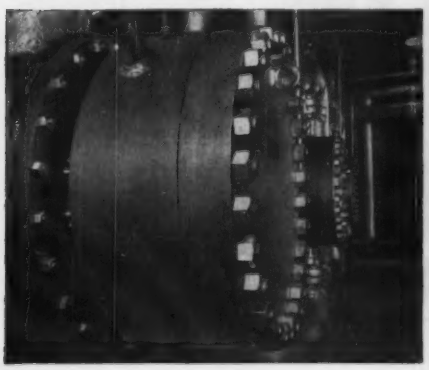
The installation of 6 Ross High Pressure Fuel Oil Heaters (illustrated) at the Pacific Gas and Electric Co.'s Station P Steam Plant in San Francisco is typical. Featuring forged oil channels with integral tube sheets and a double tube sheet arrangement to insure against any possibility of fuel oil contaminating the steam system, these rugged units demonstrate Ross' resourcefulness and experience in dealing with both the average and the specialized power engineering problem.

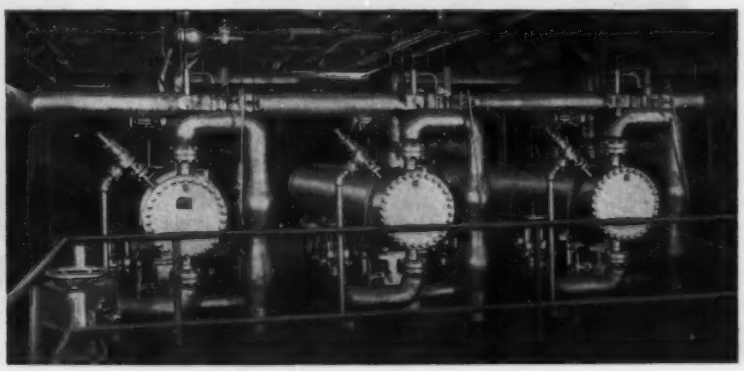
Your requirements, too, can be met with the same, exacting Ross attention to details. Inquire now. Ross offices are in all principal cities.

For recommendations on specialized heat exchangers, as well as on surface condensers, turbine oil coolers, engine oil and water coolers, compressor inter and after coolers and related power plant equipment, you'll profit by consulting a Ross engineer.

ROSS HEAT EXCHANGER

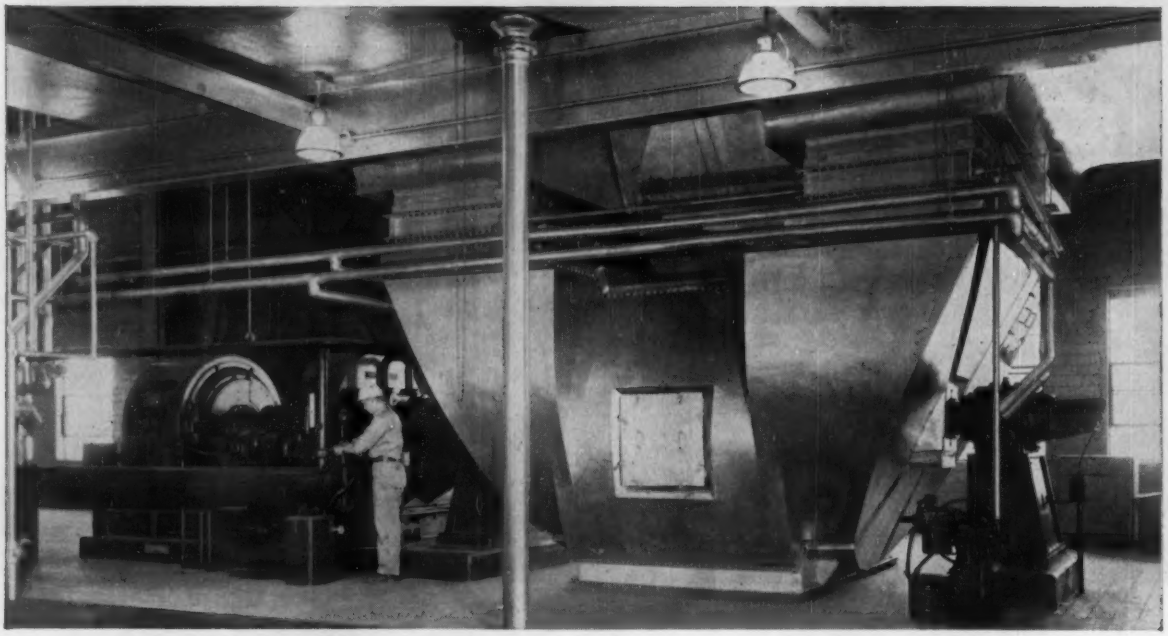
Division of AMERICAN-Standard



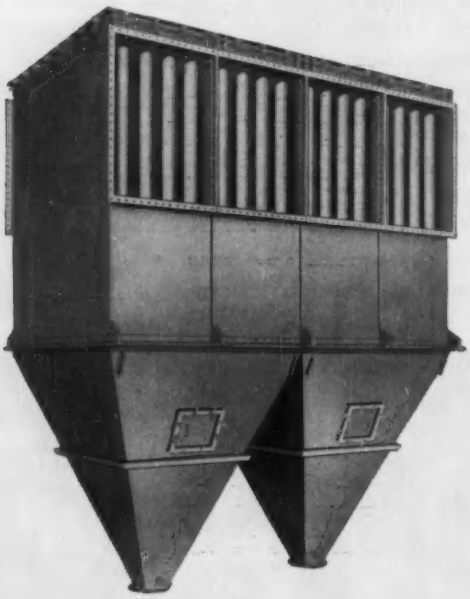


American Blower Air-Handling Equipment

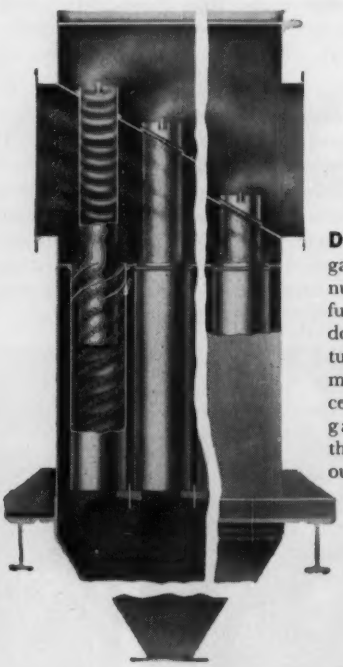
Proved efficiency



American Blower Induced-Draft Fans offer high static efficiency at low rpm. Like all American Blower mechanical-draft equipment, they are accurately formed and welded; fan rotors carefully balanced; all parts are minutely inspected for dimensional accuracy. They require a minimum space and minimum maintenance.



Series 342 Precipitator is easy to install and very effective in controlling fly ash. The over-all performance of each tube is comparable to the high efficiency of a small-diameter cyclone.



Dust-laden air or gas enters inlet plenum; gravity and centrifugal action force dust downward, adjacent to tube wall; dust is skimmed into gas-tight receptacle; cleaned air or gas moves upward through outlet tubes to outlet plenum.

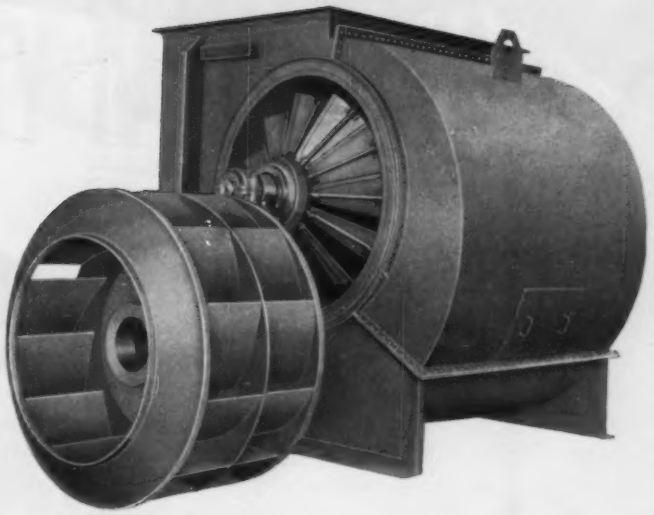
. . . maximum performance!

American Blower Mechanical Draft Fans

To meet the peak efficiency demanded of mechanical-draft equipment today, you'll be better off if you select spacesaving and efficient American Blower Mechanical Draft Fans.

Combining modern manufacturing methods with perpetual research and development, American Blower produces complete fan equipment for all types of mechanical draft. These induced-draft or forced-draft fans will fit your exact specifications with minimum maintenance and minimum boiler "outage."

If you are investigating mechanical-draft equipment—for new or existing installations—you'll do well to check on American Blower's line of Mechanical Draft Fans with guaranteed performance ratings. We welcome the opportunity of quoting on your requirements.



Forced Draft Fans for quiet indoor or outdoor installations. Heavy, reinforced housings and wheel-shaft assembly mean longer life, while special streamline inlets give utmost efficiency.

American Blower Precipitators

For maximum collection efficiency, choose the *best*—a dependable American Blower Precipitator!

Your fly ash problems can be met by installing a Series 342 Fly Ash Precipitator which offers good efficiency over the normal operating range, while it gives reliable, trouble-free performance.

American Blower's line of Fly Ash Precipitators and Dust Collectors has gained wide acceptance in leading public utilities and industrial plants.

For complete information on American Blower Dust Collectors and Precipitators as well as other air handling products, call our nearest branch, or write direct. American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ont.

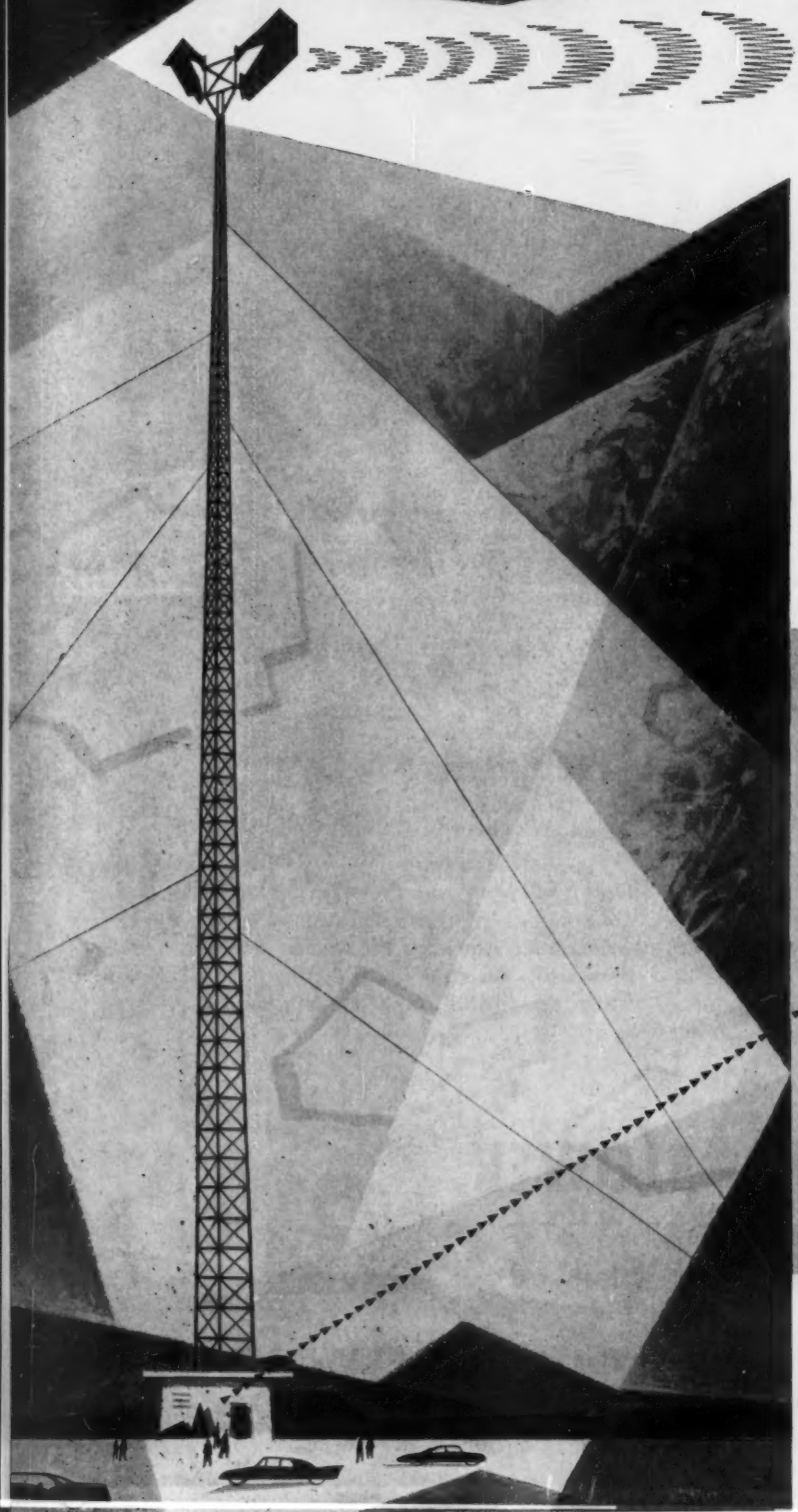
AMERICAN BLOWER

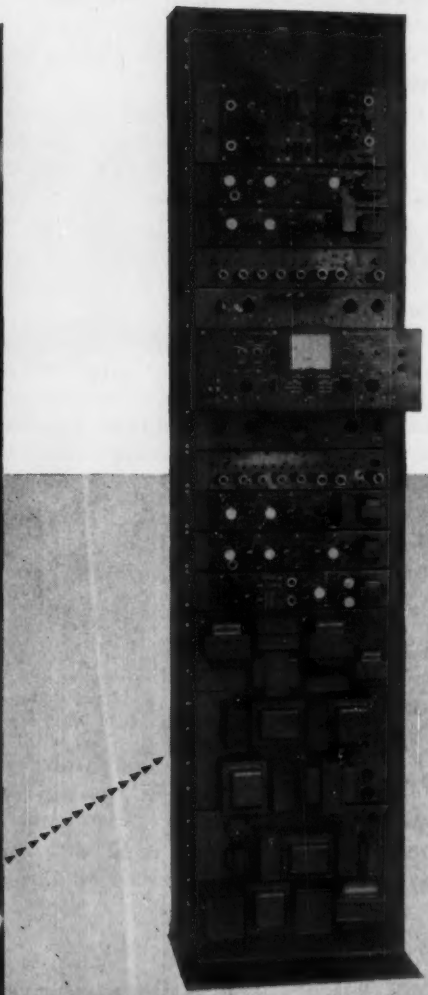
Division of AMERICAN-Standard

QUALITY PROTECTS YOUR INVESTMENT... AMERICAN-Standard QUALITY IS AVAILABLE AT NO EXTRA COST

PHILCO *Announces*

NEW CLR-9 HIGH C





The CLR-9 terminal (shown with covers removed) consists of wave-guide and preamplifier, IF assembly, baseband drop, modulator, reflector control, servo, master control and tubeless power supplies.

CHANNEL DENSITY MICROWAVE

WITH 240 VOICE CHANNEL CAPACITY

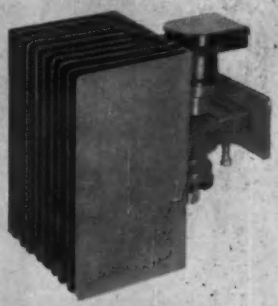
Here is high channel density and outstanding reliability of operation—plus individual Automatic Standby for transmitter and receiver. The new Philco CLR-9 Microwave System is designed for quick installation in standard relay racks . . . and engineered with built-in metering and accessibility to all critical test points for easy field maintenance.

Performance reliability is sharply increased by the use of tubeless power supplies—new semiconductor rectifiers replace tubes. The use of printed wiring panels increases circuit stability—printed circuitry is keyed for easy identification—may be quickly replaced by maintenance personnel (permits efficient, centralized depot maintenance). Klystrons in the new CLR-9 are cooled by convection . . . the use of more compact heat sinks eliminates the need for bulky blowers.

The CLR-9's 240 voice channel capability is maintained even in repeater operation, to provide full duplex transmission and reception in both directions. Integrally mounted standby equipment is included.

- **A new dimension in communications reliability . . . for continuous unattended operation.**
- **Baseband capacity for 240 channels or more.**
- **Peak performance at moderate cost—power supply capacity sufficient to accommodate both primary and standby equipment.**
- **Duplex transmission of wideband composite multiplex voice signals.**
- **Incorporates new low noise conversion and preamplifier circuitry.**
- **Integrated, fast, automatic standby selection included in one rack with individual back-up for transmitter and receiver functions.**

Heavy-duty, tubeless power supplies increase reliability by employing semiconductor rectifiers—assures minimum maintenance and very moderate operating cost.



Heat sinks cool the Klystrons by convection—compact CLR-9 needs no bulky blower system.

Rugged printed wiring panels increase circuit stability—easy identification simplifies maintenance.

PHILCO®

Government & Industrial Division

Philadelphia 44, Pennsylvania

In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

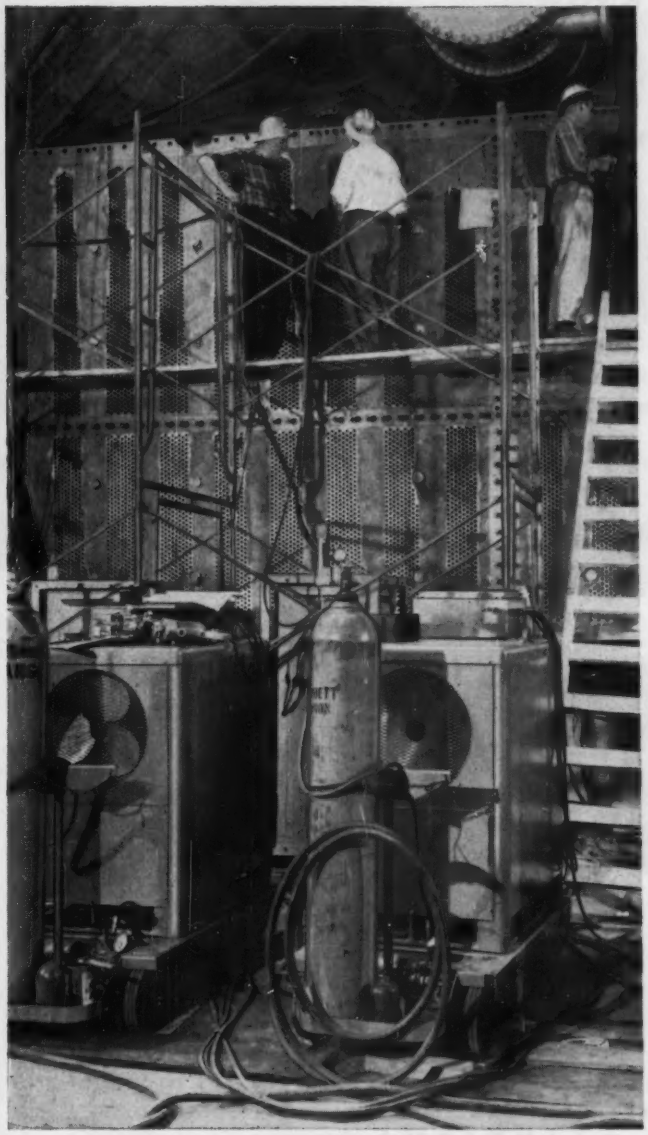
Now-

A-C
ALLIS-CHALMERS

A-5531

welded condenser tubes

Allis-Chalmers builds first condenser with welded tubes to insure against condensate contamination



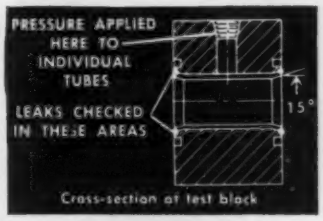
The big feature of this new 90,000-square-foot condenser: tubes are welded instead of rolled to form a seal with the tube sheets.

This type of construction is designed to meet the new problems created by supercritical pressures and nuclear power generation.

Several years of research by Allis-Chalmers preceded this installation at The Dayton Power and Light Co. It was necessary to determine the compatibility of various metals, develop welding techniques (including the special welding gun shown) and find ways of preventing distortion.

As a result of this research, conventional naval brass sheets and admiralty tubes can be used in this new unit. Circular grooves around each hole in the tube sheet help confine the heat to the area being welded, thus reducing welding current, tube sheet heating, and hence the possibility of distortion.

For further information regarding this new development, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



The 90,000-square-foot condenser for Unit No. 4 at Dayton Power and Light Company's Frank M. Tait Station. Although this is not a supercritical unit, the boiler is of the once-through design as used for supercritical installations.

ALLIS-CHALMERS

MEN RESPONSIBLE FOR

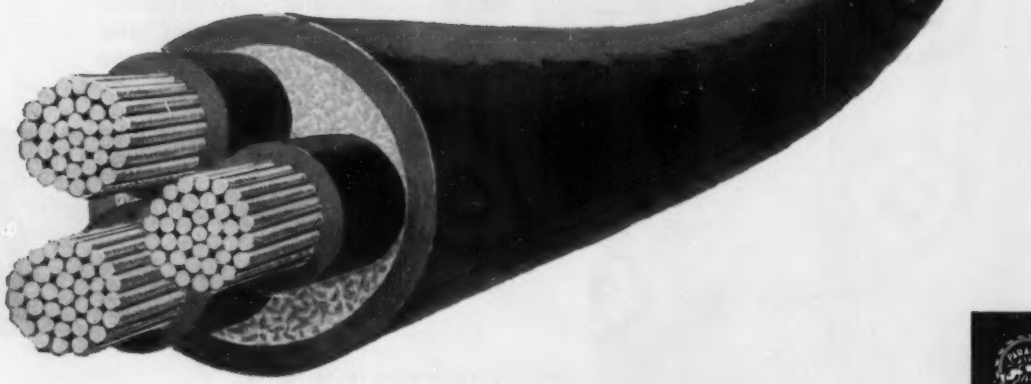
POWER DISTRIBUTION KNOW...

IF IT'S PARANITE IT'S RIGHT!®

FROM POWER TO CONTROL CABLE...

Paranite has earned an unquestioned reputation for quality wire products and dependable service! Overhead . . . or underground . . : there's a Paranite cable specifically engineered to perform in excess of your requirements. Super-Pararite® butyl rubber insulations have been developed to withstand conditions in *your* area. Copper or aluminum bare or weatherproof cables—ACSR or line wire (formerly products of Midland Wire Corporation) are available.

LIVE BETTER ELECTRICALLY



PARANITE WIRE AND CABLE

DIVISION ESSEX WIRE CORPORATION

FORT WAYNE 6, INDIANA

MANUFACTURING PLANTS: ***Birmingham, Ala.; Anaheim, Calif.: Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio**

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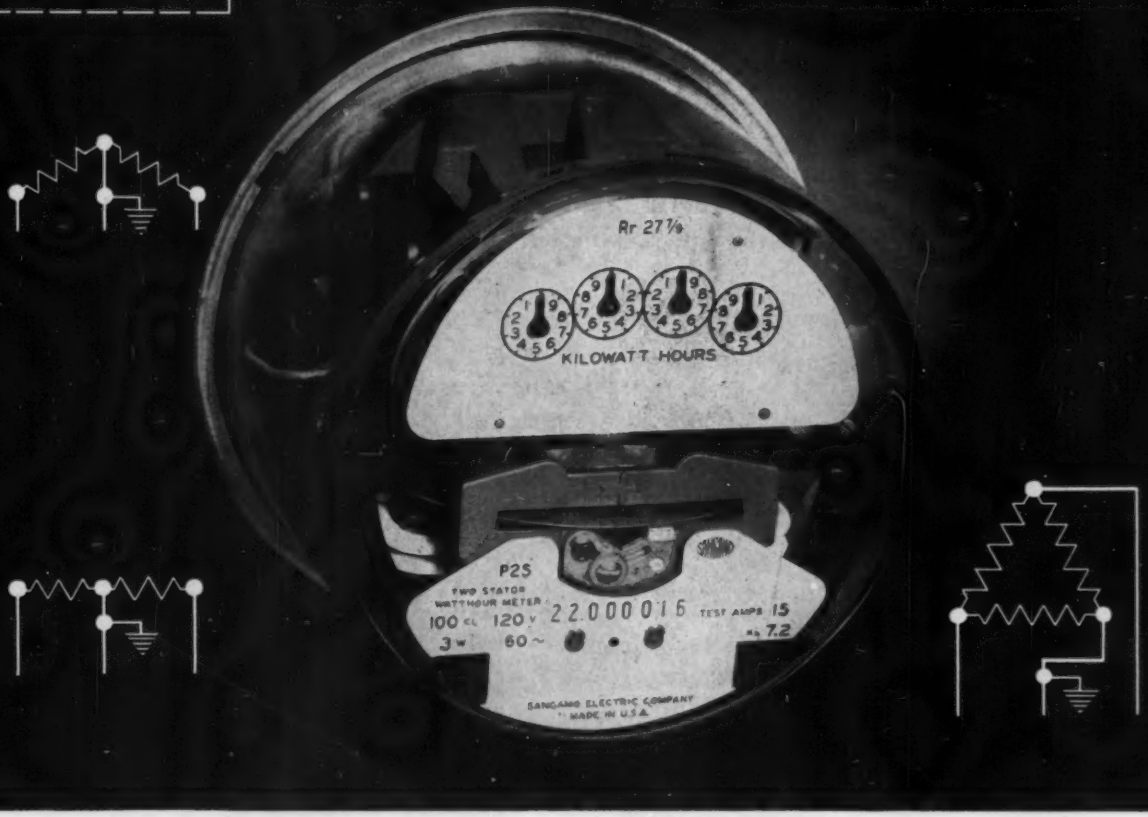
*Newark, New Jersey
Omaha, Nebraska
*Portland, Oregon
Upper Darby (Philadelphia,) Pa.
Phoenix, Arizona
Rochester, New York
*Saint Louis, Missouri
*San Francisco, California
Springfield, Illinois

NEW TWO-STATOR NETWORK METER



New economies with Sangamo Type P2S for your fast growing polyphase loads

APPLICABLE TO SMALL LOADS AND LARGE ONES. Range extended in both directions permits meter to start at ¼% of rated load yet operate continuously at 666⅔% of rated load with a maximum temperature rise of 50° C. Gives economies through increased range of application.

APPLICABLE TO SERVICE OF MANY VOLTAGES. Accurate registration without special calibration is provided for circuit variations from 42% to 125% of rated voltage. A single meter, the 240 volt P2, may be used on 120/208, 240/416 and 277/480 network systems, and also on 3 wire 3 phase and 3 wire single-phase circuits. Gives economies through reduced stocks.

TIME SAVED IN ADJUSTMENTS. Only four adjustment points—full load, light load, balance, and power factor—reduce testing and calibration time.

SAVINGS IN HEIGHT AND COVER REPLACEMENT. The Sangamo P2S Meter has been substantially reduced in height. The cover is the same as that used on all singlephase metal base socket meters manufactured since 1936.

PROVEN ECONOMY THROUGH SLOW SPEED. Sangamo *slow speed*—proved so successfully on the singlephase Type J2 Sangamo Meter—gives even greater benefits in two-stator meters. Reduced series damping and fewer revolutions just naturally mean greater accuracy and better performance.

Sangamo Type P Meters will be available for measurement of all types of polyphase service.

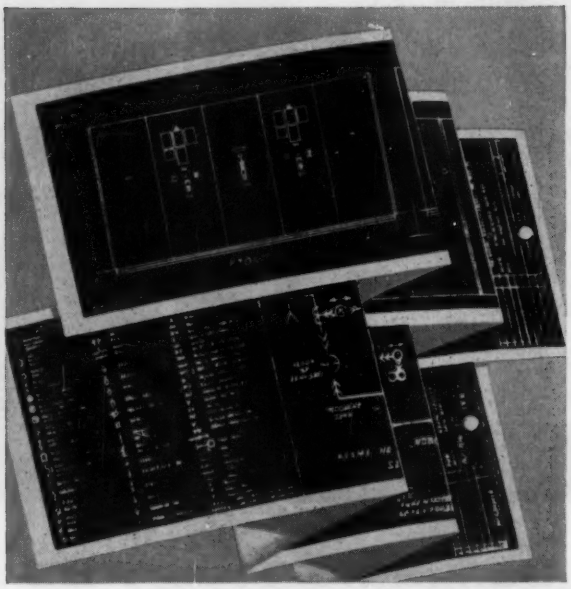
SANGAMO *Electric Company*
SPRINGFIELD, ILLINOIS

JM3

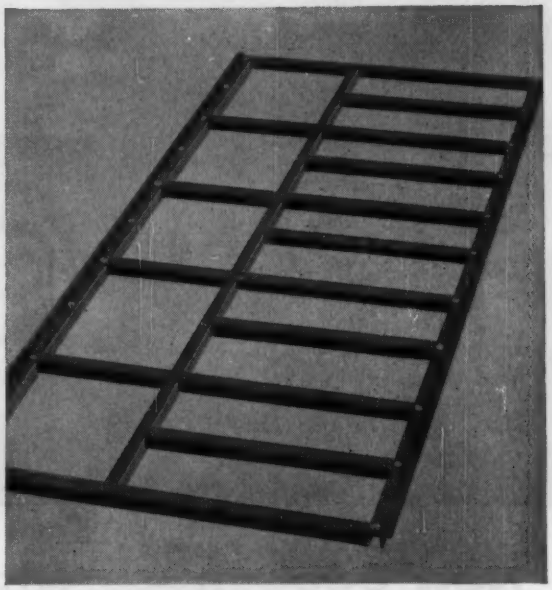
METAL-CLAD SWITCHGEAR

EASY INSTALLATION SAVES YOU TIME AND TROUBLE

I-T-E pre-engineers your installation before shipment... eliminates last-minute on-the-job fitting of switchgear to channel base



1. Complete drawings in advance. Shortly after placing your order, you will receive complete drawings showing the floor plan layout, outline dimensions, and single line diagram of the entire installation.



2. Prefabricated, painted channel base delivered first. Shipped upon request, well ahead of other equipment. Foundation bolt holes are pre-drilled to align with holes in switchgear housing.

Long before delivery of your I-T-E Metal-Clad Switchgear, you begin benefiting from the preliminary engineering and construction work which is a part of I-T-E's service to customers. It's another extra assurance of dependable performance you can expect from I-T-E equipment.

Floor plan, outline and single line drawings are supplied well in advance. Hence conduit can be run, floors poured, channel base set in place, and cables pulled. The switchgear, when it arrives, can be moved into position and connected according to plan quickly—saving you many installation hours on your premises.

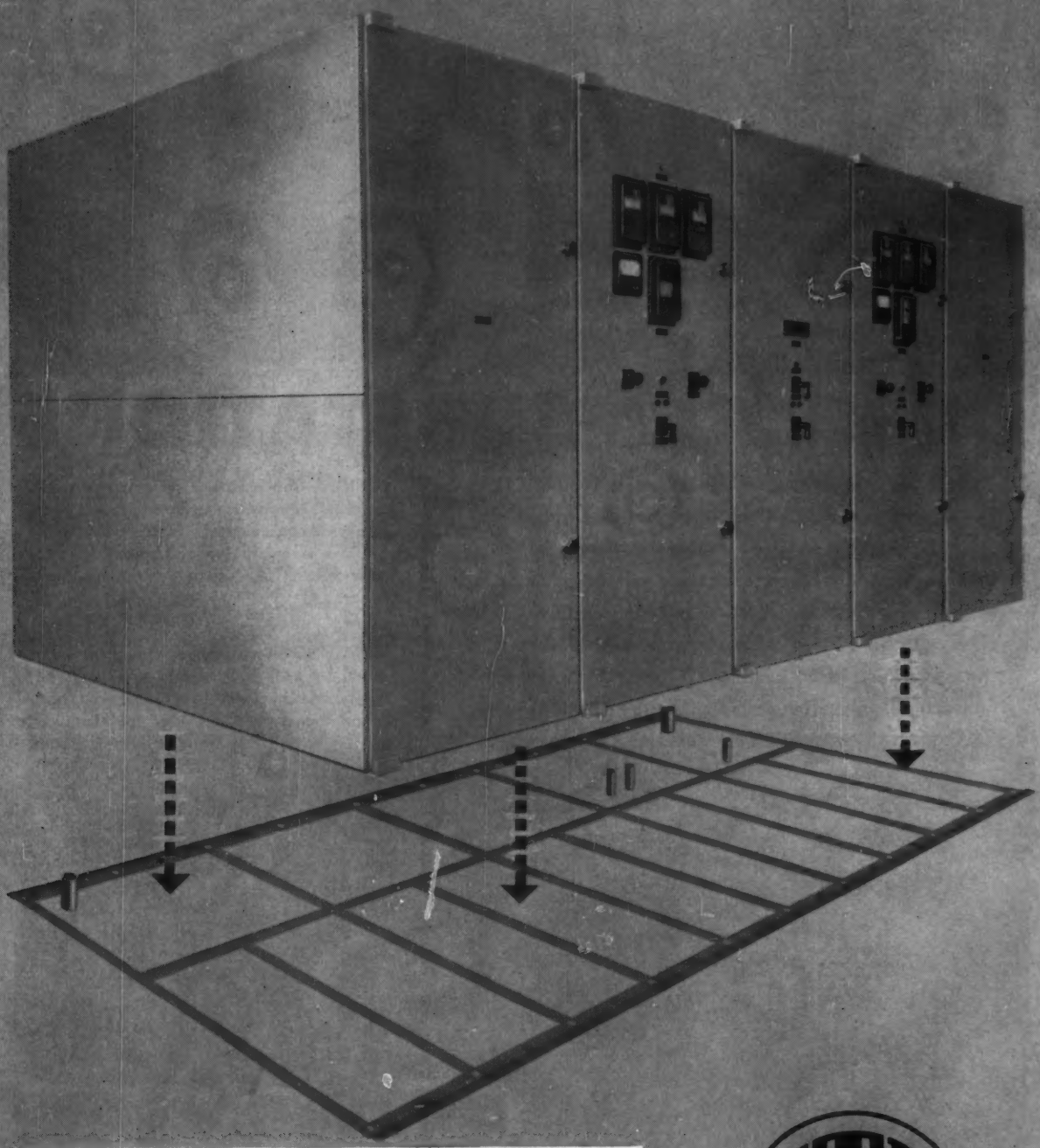
I-T-E's advance planning for you helps insure that your switchgear installation can be completed well within the time allowed by your construction schedule.

In addition, of course, you benefit from the superior engineering, design and construction of the various components making up an I-T-E switchboard—all of which contribute to its faithful trouble-free performance for years after the installation.

If you are planning new construction, get full details on I-T-E Metal-Clad Switchgear, rated through 13.8 kv, 3000 amperes continuous and 750 mva interrupting. Contact the I-T-E sales office near you. Or write for Bulletins 7004B and C. I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Phila. 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY—Switchgear Division

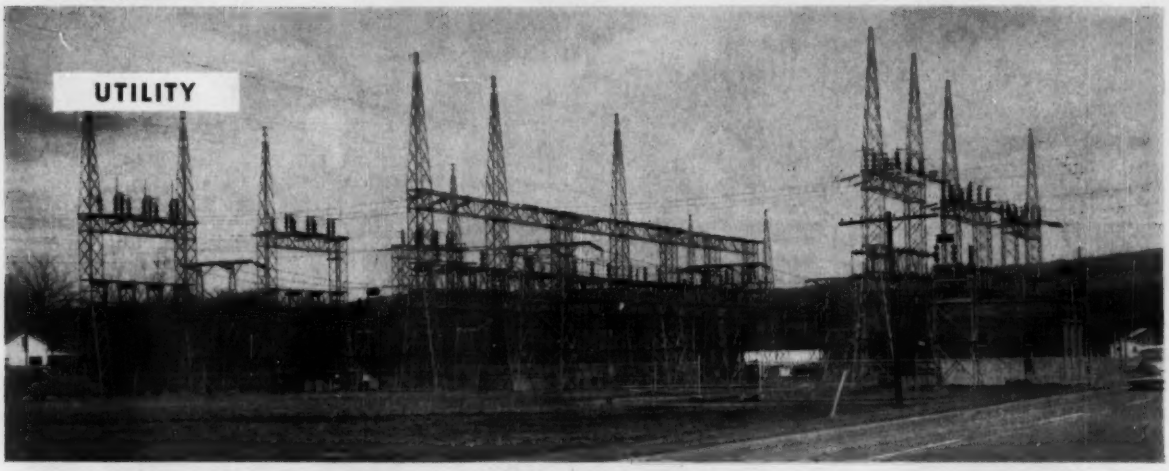
IN CANADA: EASTERN POWER DEVICES, LTD.



3. Sure fit—no delay. Channel base is embedded into the floor first. Then when switchgear is delivered it can be installed immediately. Sturdy I-T-E housings can be lifted in one piece by toe jack or chain hoist without distortion.

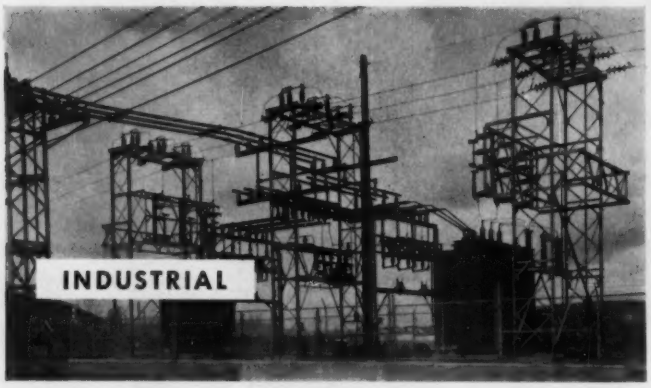
I-T-E

R&IE Unified Responsibility for...



OUTDOOR SUBSTATIONS

From Layout to Line—the R&IE Unified Responsibility for all structure and switching problems is your assurance of a properly designed, well coordinated substation. Either a transmission structure or a service entrance industrial structure, simple or complex, is carefully developed with an aim to maximum operating economy at the lowest cost. "Under one roof" R&IE controls design, fabrication, application and manufacture of blade switching equipment, and shipping. Now is the time—during these cost conscious planning days—to place your problems with R&IE.



DESIGN—The problems of electrical clearances, efficient switching arrangements, wind stress, wire pull, weather, air contamination—all have been studied and solved for over forty years. Take advantage of this experience.

DETAILING—Development of single line diagrams by R&IE experienced draftsmen, detailers, and checkers—gets the job into fabrication sooner, and provides for clean cut, understandable drawings that you can clearly read as the job you want.

FABRICATING—R&IE fabricating facilities are modern and efficient—with time-saving automatic spacing and punching equipment, straightener and bending machines, power shear cutters, and galvanizing facilities—all operations resulting in neatly packaged, well marked substation members that will go together properly on the erection site.

APPLICATION OF BLADE SWITCHING EQUIPMENT—The relation of substation production and the building of air-switches is important—when both are handled "under one roof." With over forty years' design know-how, R&IE equipment application engineers have pioneered many switch features which are today's standard of the industry.

R & IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER COMPANY
GREENSBURG, PA.

R&IE

Wheeler HI-OUTPUT FIXTURES

deliver more light per foot of lamp length!

HI-OUTPUT "D-8500" LINE FIXTURES by Wheeler—designed for use with 100 watt and 60 watt rapid start lamps operating at 800 MA.

Diffuser apertures provide a small upward component of light to relieve severe brightness contrast . . . and allow for heat dissipation.

Wheeler "D-8500" Hi-Output Fixtures are ideally suited for medium to high mounting applications.

Ask your electrical wholesaler — or write

Wheeler Reflector Company
DIVISION OF FRANKLIN RESEARCH CORP.
275 Congress Street, Boston 10, Mass.

Installation—Ucinite Div. of United-Carr Fastener Corp.

Another example of Wheeler's

"PACKAGE PLAN" LIGHTING —

the efficient, time-saving way to solve all your lighting requirements at one time . . . from one source!

Distributed Exclusively through Electrical Wholesalers

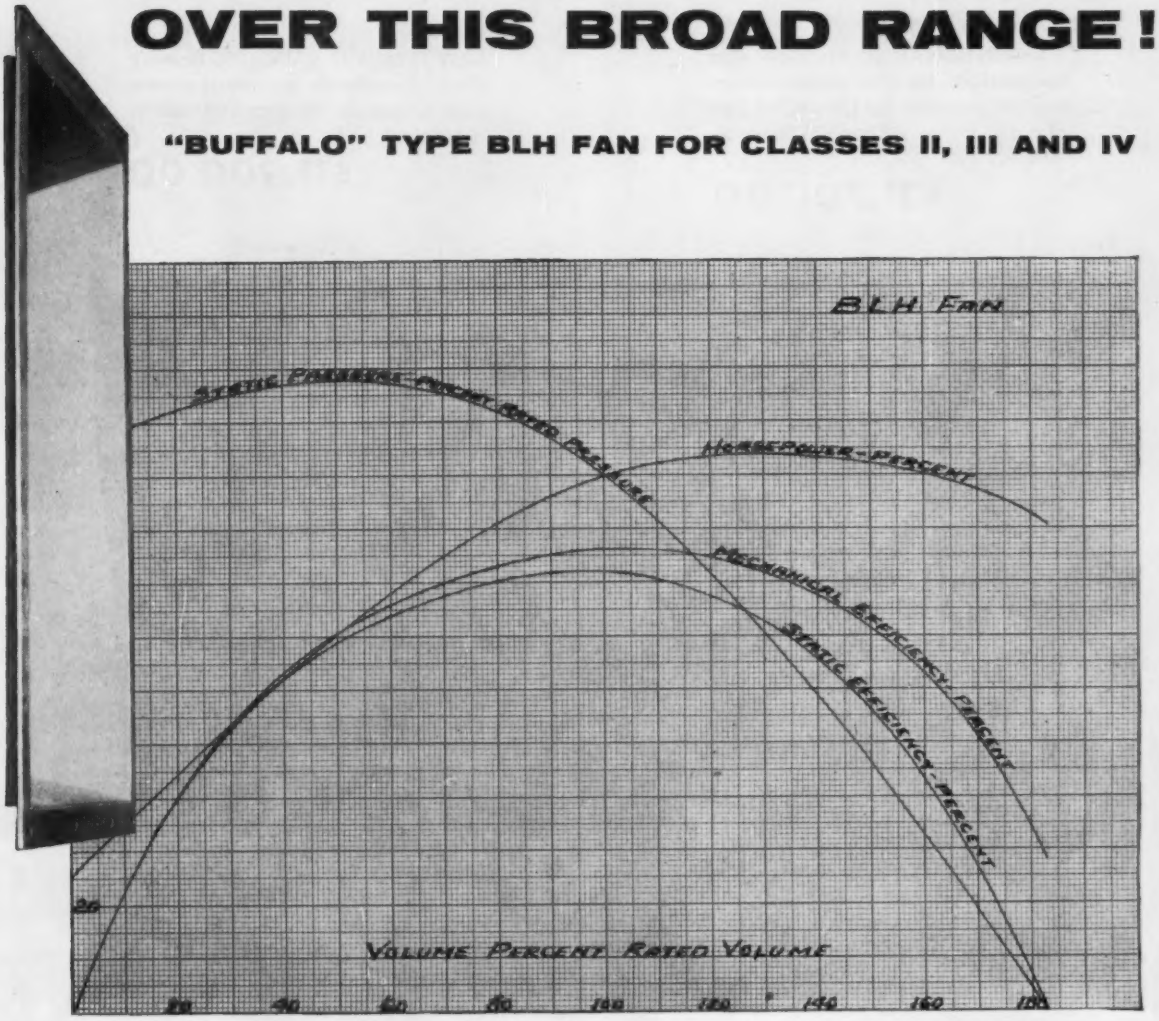
A **NEW** **HIGH IN**

"Buffalo" Type BLH Fan for high pressure air moving. Its efficiency is due to advanced rotor, inlet and outlet features developed exclusively by "Buffalo".

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT

FORCED DRAFT EFFICIENCY OVER THIS BROAD RANGE!

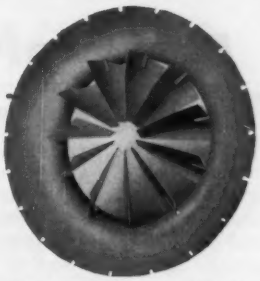
"BUFFALO" TYPE BLH FAN FOR CLASSES II, III AND IV



If peak efficiency, along with durability and servicability, are important to you in a forced draft fan, the BLH deserves your closest investigation.

Note the broad curve of mechanical efficiency above — 80% or better from 65% to 135% of rated volume — permitting flexibility of operation. This performance has been achieved through inlet-to-outlet streamlining — a smooth inlet bell, cantilevered inlet vanes, backward curve blades, specially curved rotor flange and divergent outlet — minimizing turbulence at every point to give air the smoothest ride ever. And the new "Buffalo" Variable Inlet Vanes can be substituted for the stationary inlet vanes for smooth draft control with no performance loss in open position.

The BLH is one of a complete *series* of "Buffalo" Draft Fans available to meet your draft requirements exactly, with no guess work and no compromise. Write for Bulletin F-200 and recommendations on your problem.



"Buffalo" Cantilevered Variable Inlet Vanes have no center ring to cause entry loss, and the control mechanism is out of the air stream, assuring smooth volume control without sacrificing fan performance.

BUFFALO FORGE COMPANY

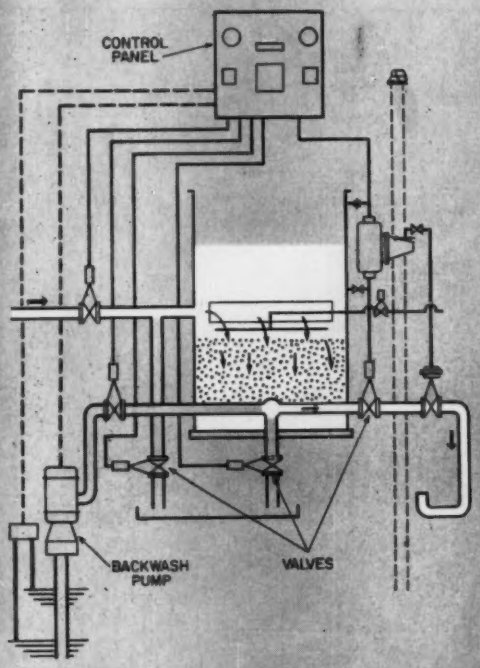
BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

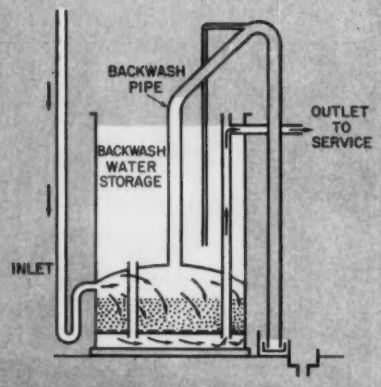
CONVENTIONAL gravity filter and hydraulic controls for automatic operation. Approximate installed cost of a unit that will filter 500,000 gallons per day:

$21,700.00



NEW PERMUTIT VALVELESS Gravity Filter. Completely automatic operation. Approximate installed cost of a 500,000 gpd unit:

$11,900.00



HOW IT WORKS: As dirt collects on the sand, increased head pressure slowly raises the water level in the large backwash pipe. See diagram. When it spills into the downward section of the pipe, it starts a siphon (backwash) flow that draws water down from the Storage area and up through the sand, "floating" dirt off to waste. When backwash water is gone, air enters the small tube and stops the siphon. Flow through the sand reverses and the first filtered water (rinse water) goes to Storage area until full. All flow then runs to Service.

New Valveless Water Filter Saves $$ for Industries, Cities, Electric Companies

• Big water users like city water departments, steam stations, refineries, chemical plants and paper mills can substantially reduce the cost of their water-conditioning equipment and its operation and maintenance . . . by adopting a new automatic Valveless Filter developed by engineers of the Permutit Company (N. Y.).

The simplified design makes ingenious use of the siphon and other hydraulic principles to replace expensive valves, flow controllers, pumps and hydraulic or pneumatic control systems. The design also prevents wasteful, excessive use of water for backwashing or rinsing. Tanks are shipped set-up to reduce installation costs. The absence of moving parts virtually eliminates maintenance costs.

The Valveless Filter produces uniform, high-quality water. It cannot be "forced." Backwashing or rinsing cannot be too little or too late . . . or accidentally run to Service. And the filter cannot develop common troubles like "cracked" or "upset" beds, "channeling" or "mudballs."

Single Valveless Filters or multiple units for any volume requirement are available. Present installations include units for industrial plants treating water for both process and drinking.

Send for free descriptive bulletin. Address: The Permutit Company, Dept. **EW-9,** 330 West 42nd St., New York 36, N. Y. or The Permutit Company of Canada, Ltd., Toronto 1, Ontario.

PERMUTIT®

rhymes with "compute it"

Water Conditioning

Ion Exchange • Industrial Water Treatment

ELLIOTT
Fabri-Seal
INSULATION

not one insulation failure in 8 years . . .

hand-wrapped MYLAR*-BACKED MICA withstands severe temperatures and operating conditions

This is one principal reason why the Elliott Fabri-Seal insulation system has achieved the remarkable 8-year record. All slot parts of Elliott coils have always been meticulously hand-wrapped with a laminated mica sheet. When Mylar became available, Elliott pioneered in its use. Mylar adds dielectric strength, and assures maximum protection from temperature and age since this thin, tough, flexible backing permits a 50% increase in the thickness of the mica. For complete details, write Elliott Company, Ridgway, Pa.

*DUPONT TRADEMARK

Use of class B (mica wrapper) in Fabri-Seal class A coils is one more reason for the enviable record of machines such as this first induction motor specifically designed for outdoor service.

Here is another example of the 1,900,000 hp of large squirrel-cage induction motors with Elliott Fabri-Seal insulation which are serving utilities and industries all over the world *without one insulation failure since 1948.*

ELLIOTT Company

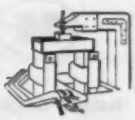
R7-28

FIVE OTHER REASONS WHY ELLIOTT "FABRI-SEAL" INSULATION INSURES LONGER SERVICE LIFE

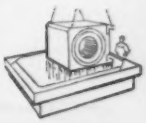
IMMERSION-TEST EVALUATES COIL LONGEVITY

SEALED AT ALL VULNERABLE POINTS

VACUUM AND PRESSURE IMPREGNATION



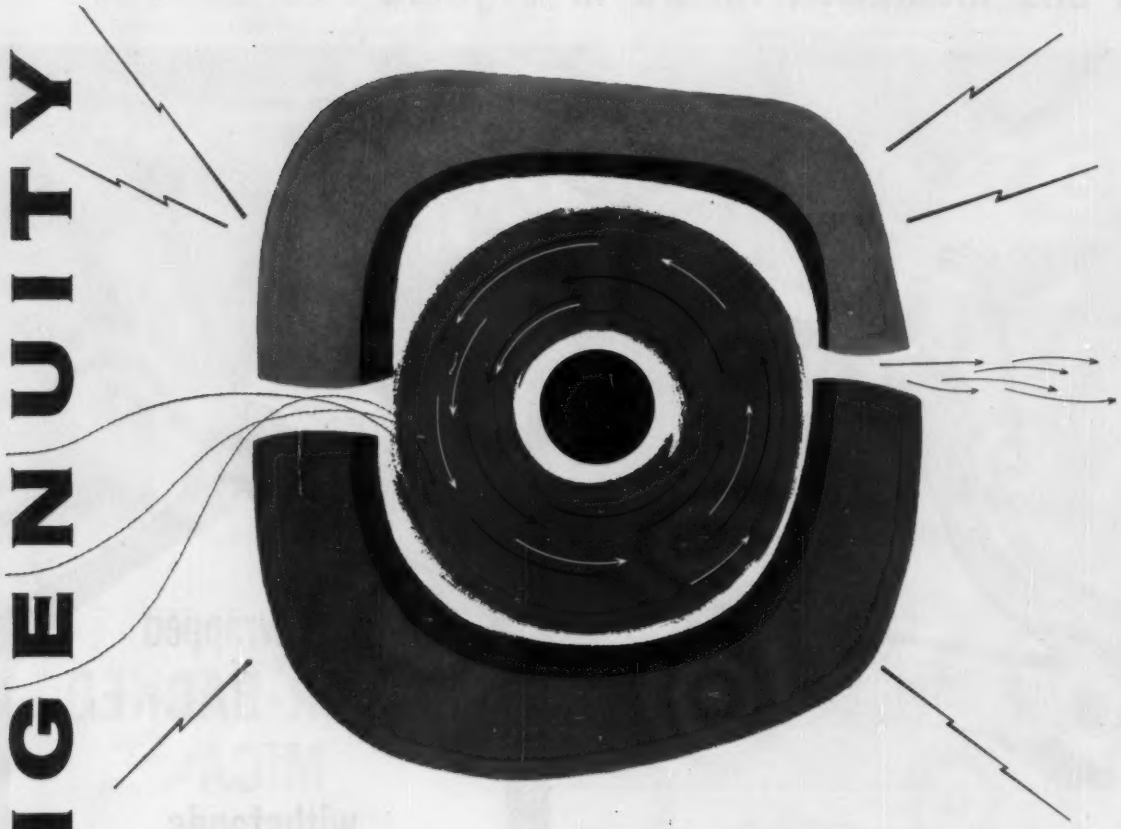
TURN-TO-TURN TESTED AT HIGH SURGE VOLTAGES



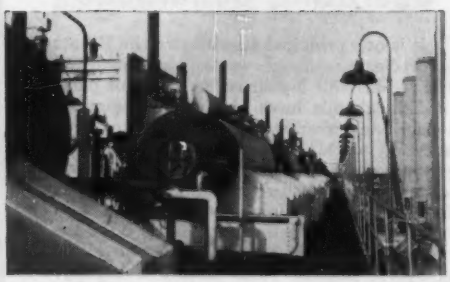
EVERY STATOR IMMERSED AND BAKED

call KE for plant expansion or new facilities

INGENUITY



has made KE a major builder of power facilities



A 475,000 KW power generating facility, engineered and built by KE.

Faster construction, more efficient operation, lower costs—these are benefits Kaiser Engineers' ingenuity has brought to power projects ranging from America's largest dam to power installations for industrial plants.

Experienced KE engineers can take your power idea from a gleam in your eye through start-up—from economic analysis through operator training.

Whether your future power needs are thermal or nuclear, call KE. Let KE's ingenuity produce real time and money savings for you.

KAISER ENGINEERS engineers-contractors
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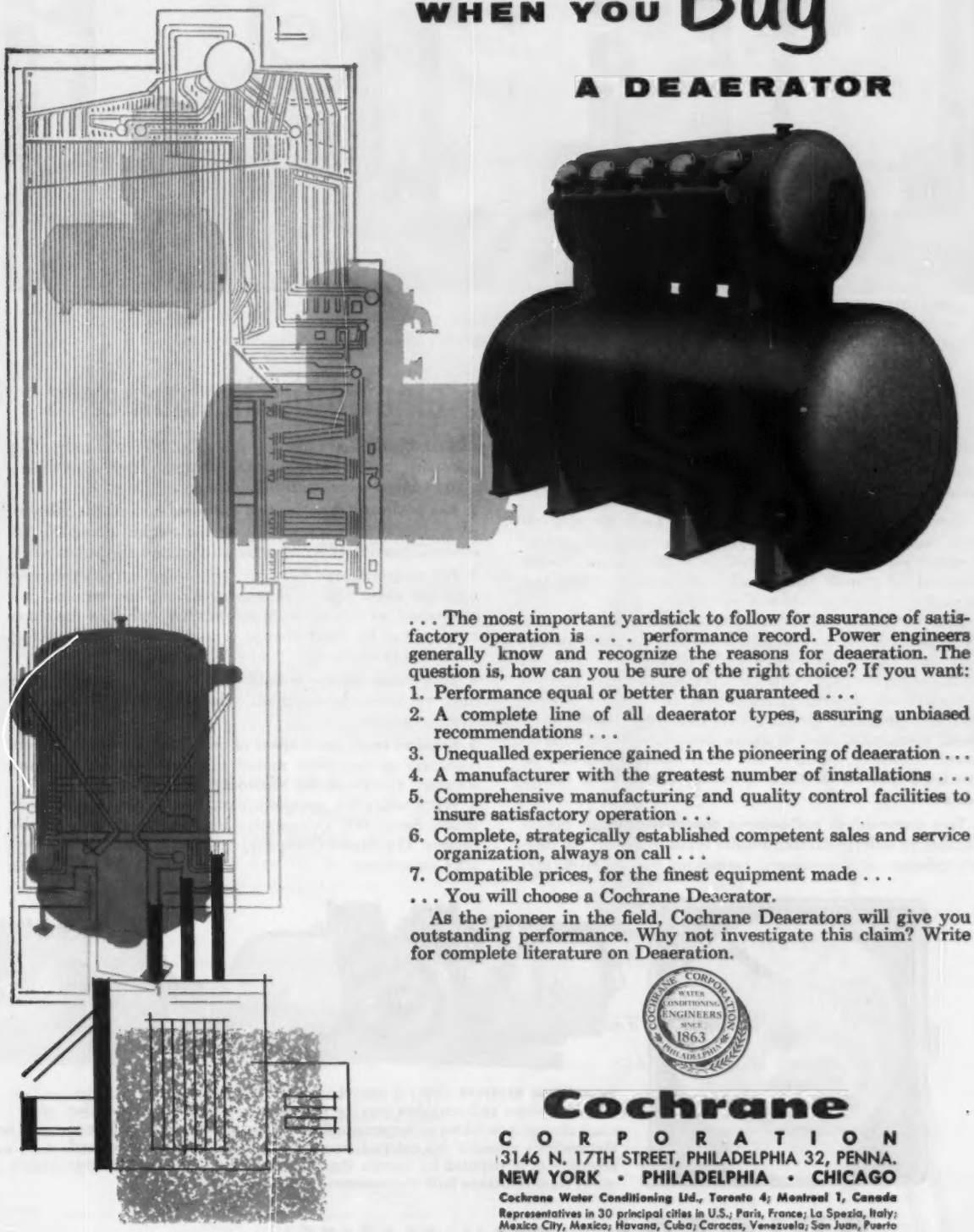
4366

COCHRANE . . . FIRST IN WATER CONDITIONING

WHEN YOU Buy A DEAERATOR



. . . The most important yardstick to follow for assurance of satisfactory operation is . . . performance record. Power engineers generally know and recognize the reasons for deaeration. The question is, how can you be sure of the right choice? If you want:

1. Performance equal or better than guaranteed . . .
2. A complete line of all deaerator types, assuring unbiased recommendations . . .
3. Unequalled experience gained in the pioneering of deaeration . . .
4. A manufacturer with the greatest number of installations . . .
5. Comprehensive manufacturing and quality control facilities to insure satisfactory operation . . .
6. Complete, strategically established competent sales and service organization, always on call . . .
7. Compatible prices, for the finest equipment made . . .

. . . You will choose a Cochrane Deaerator.

As the pioneer in the field, Cochrane Deaerators will give you outstanding performance. Why not investigate this claim? Write for complete literature on Deaeration.

COCHRANE CORPORATION · WATER CONDITIONING ENGINEERS · SINCE 1863 · PHILADELPHIA

Cochrane

CORPORATION

3146 N. 17TH STREET, PHILADELPHIA 32, PENNA.

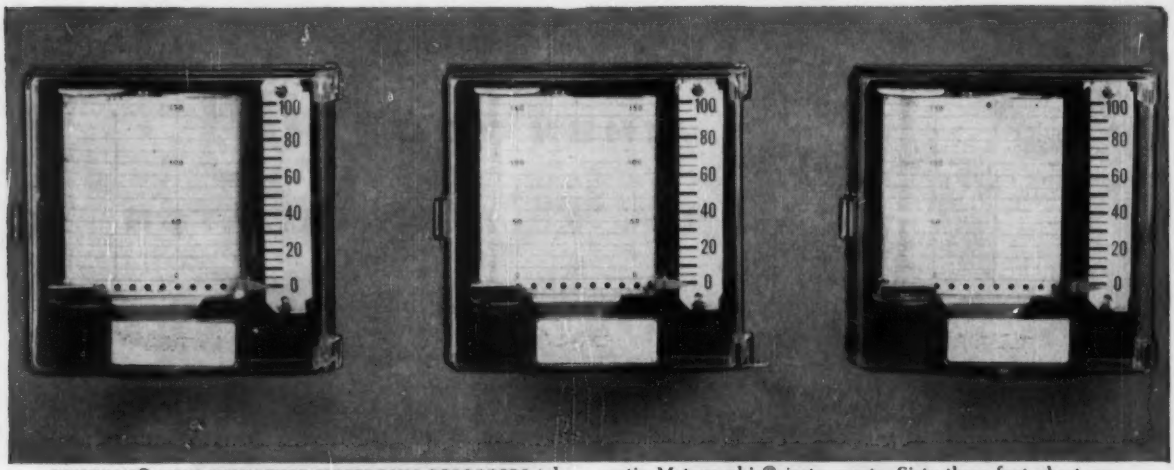
NEW YORK • PHILADELPHIA • CHICAGO

Cochrane Water Conditioning Ltd., Toronto 4; Montreal 1, Canada

Representatives in 30 principal cities in U.S.; Paris, France; La Spezia, Italy; Mexico City, Mexico; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii; Manila, Philippine Islands.

Pottstown Metal Prods. Div.—Custom built carbon steel and alloy products.

Demineralizers • Zeolite Softeners • Hot Process Softeners • Hot Lime Zeolite Softeners • Dealkalizers • Reactors • Deaerators • Pressure Filters
Continuous Blowoff Systems • Condensate Return Systems • Steam Specialties



BRISTOL'S® NEW MINIATURE ELECTRONIC RECORDERS take only 5" x 5⅛" panel space—can be mounted on 6½" centers. Size and external appearance completely match Bristol's pneumatic Metagraphic® instruments. Sixty-three-foot chart provides 31-day record at 1" per hour. Wide variety of chart speeds available with easily changed gears.

New! Compact Dynamaster electronic instruments

Full plug-in versatility, true servo-driven null-balance operation, high sensitivity are features of Bristol's new Series 663 Dynamaster recorders, indicators.

Now, for the first time, you can get all the inherent accuracy, stability and versatility of Bristol's electronic potentiometer and bridge instruments in a line of instruments designed for graphic panels and centralized recording and indicating of large numbers of variables.

The new Bristol 663 Series Dynamaster Recorders feature the same basic mechanism as full-sized Dynamaster instruments, completely redesigned and repackaged to carry out the basic graphic panel idea. They provide compact, centralized electronic recording, indication, and control of temperature, pressure, vacuum, pH, humidity, liquid level, speed, mechanical motion, smoke density, voltage, current, power, resistance, strain or any other variable that can be translated into an electrical quantity. Check these design features:

1. True motor-driven null-balance operation. Bridge, potentiometer or differential transformer types available. No delicate galvanometer movement, no moving coil, no pivots employed. Unaffected by severe vibration. Plenty of torque for operating control mechanism, retransmitting slidewires, alarm contacts, etc. with full accuracy.

2. Reads directly from sensing elements such as thermocouples, resistance bulbs and other d-c output elements. No external converters with vacuum tubes and adjustments.

3. Full plug-in design. Change from an indicator to recorder with the same type of measuring circuit and terminal arrangement, or vice versa, in seconds. Or withdraw the chassis part-way for chart change or inking without disturbing operation in any way.

4. Easy range change in field. Just substitute desired range card; no soldering required. Wide variety of ranges and spans available.

5. Requires small panel space of only 5 x 5⅛ inches. Fifteen recorders or indicators mount in space required for two standard size electronic recording instruments.

Write today for complete data on the outstanding new Bristol Series 663 Dynamaster Instruments for your applications. The Bristol Company, 116 Bristol Road, Waterbury 20, Connecticut. 6.52

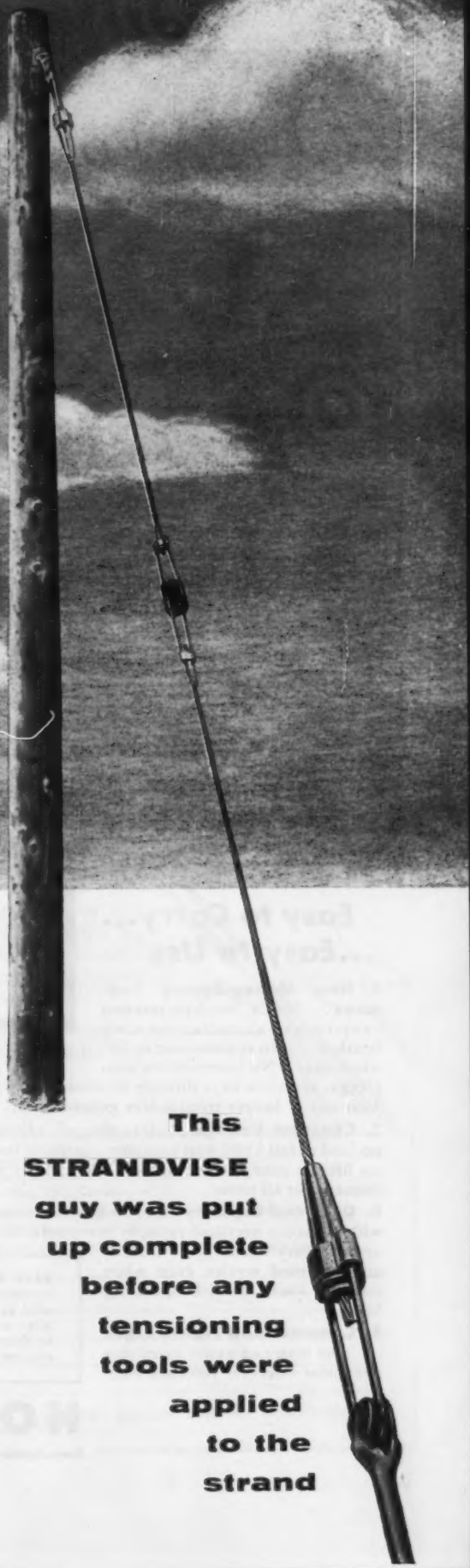
INDICATING RECEIVER (*left*) is interchangeable—in seconds—with recorder. Both indicators and recorders may be drawn to intermediate position for chart change, pen inking or inspection. Plug-in chassis (*above*) of resistance thermometer recorder. No external converter involving vacuum tubes and adjustments is required to operate Bristol's miniature Dynamaster instruments from resistance bulb thermometer or thermocouple.

BRISTOL *TRAIL-BLAZERS IN PROCESS AUTOMATION*

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Where is the Guy who put up this guy?

He's doing something else—
maybe he's putting up another one.
Anyway, he did this job all alone
in less than five minutes—
by himself.



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NO MATTER THE GRADE.
Please pick your size, fill in
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This STRANDVISE guy was put up complete before any tensioning tools were applied to the strand

Reliable

Reliable Electric Company
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Mr. Reliable:

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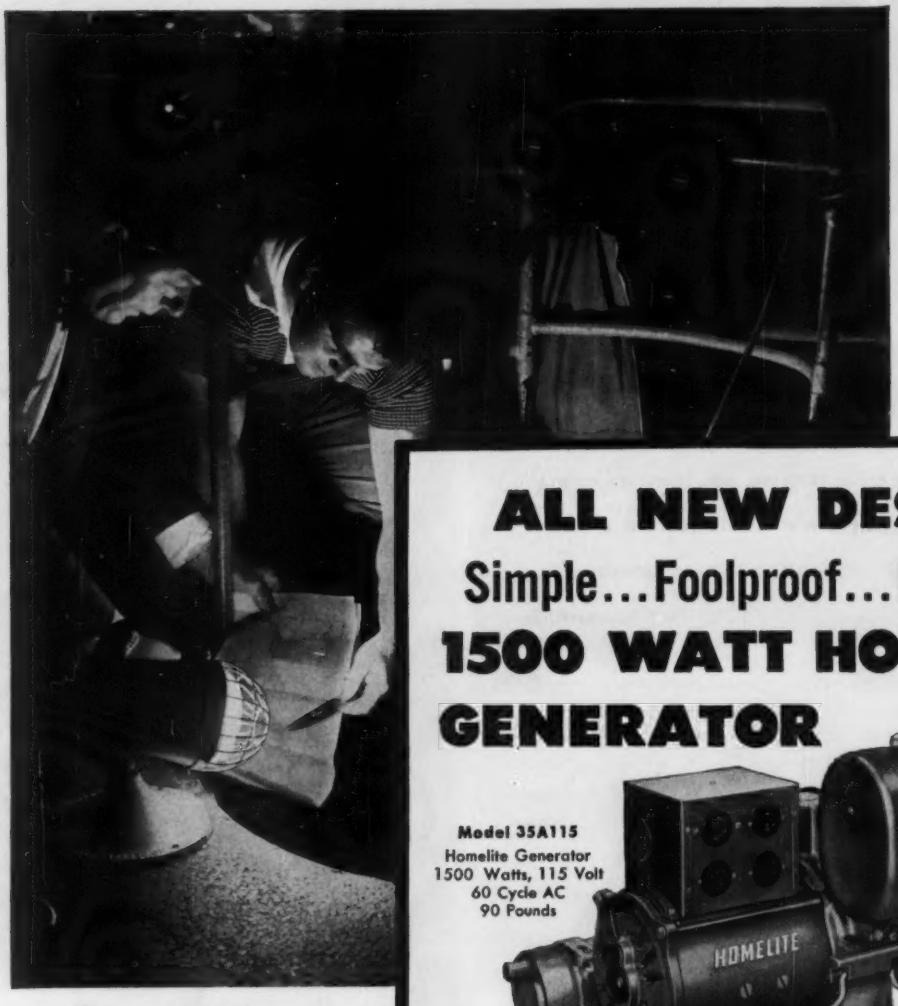

ALL NEW DESIGN!

Simple...Foolproof...Low Cost

1500 WATT HOMELITE GENERATOR

Model 35A115
Homelite Generator
1500 Watts, 115 Volt
60 Cycle AC
90 Pounds

Easy to Carry... ...Easy to Use

1. New Money-Saving Features . . . No DC brushes; just two easy-to-get-at collector ring brushes . . . No commutator or DC windings . . . No intermediate couplings; armature keys directly to shaft. Fewer parts to wear out — longer trouble-free generator service.

2. Constant Voltage . . . less than 4% change from no load to full 1500 watt capacity . . . assures long service life for your electric tools . . . guarantees top performance at all times.

3. Overload Capacity . . . 1500 watt continuous duty with generous overload capacity prevents tool stalling under heavy loads . . . insures uninterrupted service even when starting loads exceed operating loads.

4. Compact and Lightweight . . . one man can easily carry this generator wherever you need electricity to power time-saving electric tools. No need for long, hazardous power-consuming cables.

Whatever tools you want to operate — electric soldering irons, drills, floodlights, grinders, hammers, the new Homelite 35A115 generator can save you money. For a free demonstration or additional information, call your nearest Homelite representative.

SAVE EVEN MORE! New Homelite electronic idle control unit, available as optional accessory, runs engine at idle speed when no current is drawn . . . automatically brings engine to full speed when load is applied.

Ask your Homelite representative to show you how this easily-installed accessory reduces engine wear . . . increases service life . . . cuts fuel consumption.

HOMELITE *A DIVISION OF TEXTRON INC*
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Manufacturers of Carryable PUMPS • GENERATORS • BLOWERS • CHAIN SAWS

NEW RCA "MINITROL"

Dazor Mount

Desk Stand

MINIATURE

Microphone, Controls and Speaker Combination

"Clears the Desk of All That Clutter"

"Greatly Increases Dispatching Efficiency"

Here's big news for users of RCA 2-Way Radio equipment —a compactly styled unit which combines the microphone, controls and speaker!

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- Self-contained transistor pre-amplifier provides audio amplification necessary to modulate the transmitter.
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- Used to control local or remote control equipment.
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Your communications system is only as efficient in saving time and earning profits as its components. RCA . . . world leader in radio . . . offers you quality equipment to meet every requirement. Advanced engineering means greatest satisfaction, lowest maintenance. Expert service by RCA Service Company to assure peak performance.

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☐ Please send me specifications and prices on RCA "MINITROL" Microphone-Control Unit.

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NAME _____ TITLE _____
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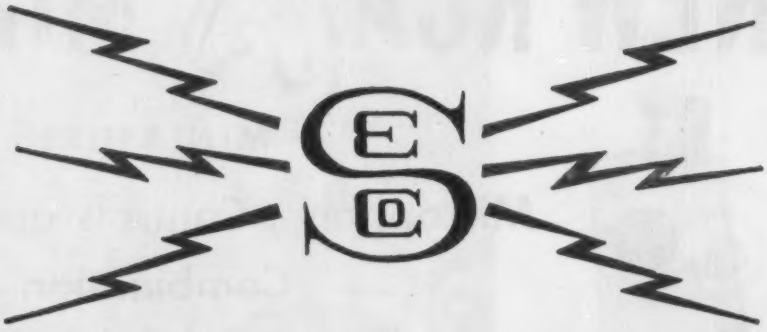
☐ Have RCA Communications Specialist make free RADIO SURVEY of my business.



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SYMBOLS
OF HIGHEST QUALITY
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IN THE
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IN BECOMING A MEMBER OF THE ALUMINUM DIVISION OF THE VAST OLIN MATHIESON ORGANIZATION, SOUTHERN ELECTRICAL BRINGS AN OUTSTANDING PERFORMANCE RECORD!

The original independent wire and cable mill built and equipped specifically for fabrication of aluminum conductor, with complete modern physical and metallurgical laboratory facilities. An American free enterprise, financed by private capital, to serve the Electrical Utility Industry.

Originated and developed the revolutionary horizontal continuous casting process for conversion of aluminum pig into Electrical Conductor grade rod. In this process Southern Electrical achieved qualitative control casting and tandem fully automatic controlled rod rolling.

Contributed numerous other refinements in the art of wire drawing, and fabrication with quality controls.

Designed and developed "Compresto" (R) type covered aluminum wires for self-supporting service drop cables.

Produced more than three hundred million pounds of wire and cable over the past ten years with proven integrity in meeting delivery promises.

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SIGNIFICANT
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Now, as an integral part of the Aluminum
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of a never-ending source of
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Two leaders in the industry, now together
to serve you better!

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ALUMINUM DIVISION

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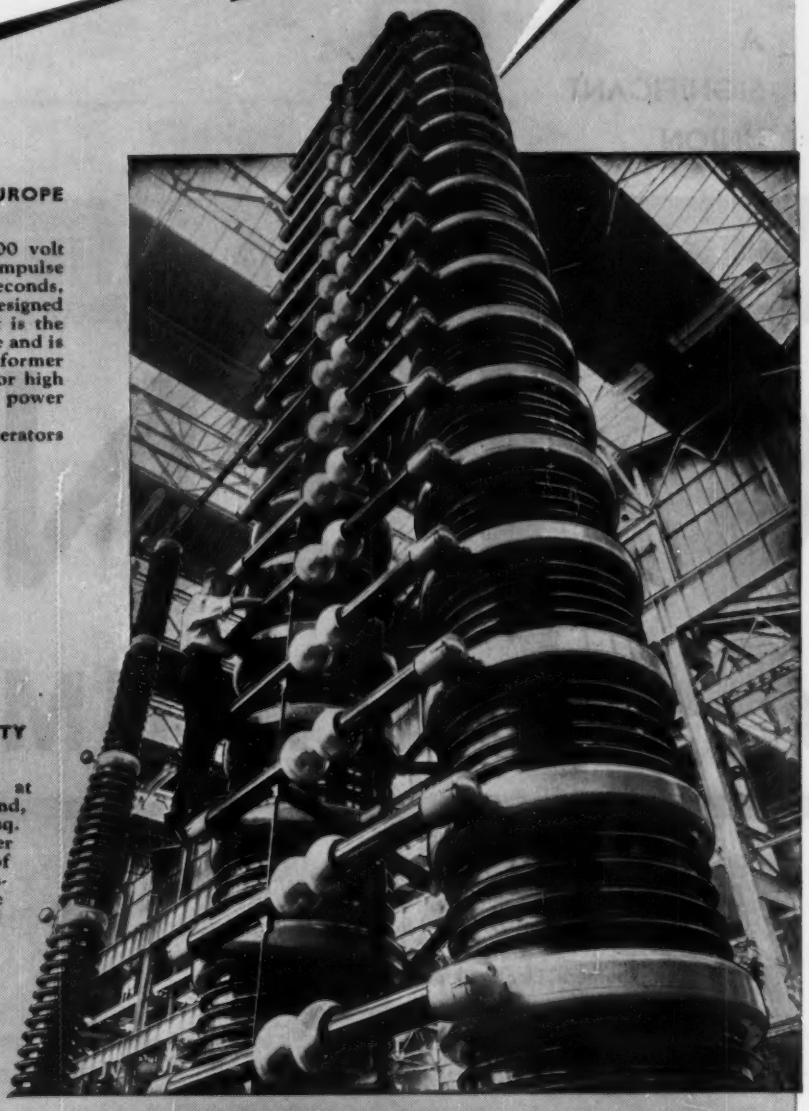
4,000,000 VOLTS!



THE LARGEST
IMPULSE GENERATOR IN EUROPE

The illustration shows a 4,000,000 volt 18 stage, 2 column Ferranti Impulse Generator, energy rating 285 kW seconds, D.C. charging 220 kV per stage. Designed and built by Ferranti engineers, it is the largest impulse generator in Europe and is now installed in the Ferranti Transformer Factory at Hollinwood, England for high voltage impulse testing of large power transformers.
Ferranti High Voltage Impulse Generators are used throughout the world.

FERRANTI

OVER 5,000,000 kVA
per annum
of TRANSFORMER CAPACITY

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C. and D.C. Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

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FT 176/2

UTILITIES EXPECT MORE FROM POWERS *American*

Series 350
SERVICE-MAINTENANCE BODY
HANDLES 3 JOBS

Series 450
MAINTENANCE AND CONSTRUCTION BODY
Another unique design, ideal for municipalities!

DUAL PERFORMANCE . . .

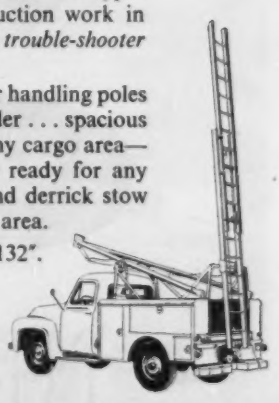
- Revolving aerial ladder for overhead work—revolves 360°—furnished in a height best suited to your needs.
- Underslung winch permits use of derrick—for handling 35′ poles—without interference to aerial ladder.

The Series 450 is available in 108″ and 132″ length.

This extremely versatile body will handle all types of service, maintenance, and construction work in small operations . . . and is an ideal *trouble-shooter* for larger utilites.

An easily-erected fold-over derrick for handling poles up to 35′ . . . a 24′ extension ladder . . . spacious bin-equipped compartments . . . roomy cargo area—all combine to make the Series 350 ready for any job at a moment's notice. Ladder and derrick stow above body . . . never obstruct cargo area.

In four lengths—84″, 90″, 104″, and 132″.



Get complete details and price information. Send for Powers-American Series 350 Bulletin #109R or Series 450 Bulletin #118 *today*.

McCABE-POWERS AUTO BODY COMPANY

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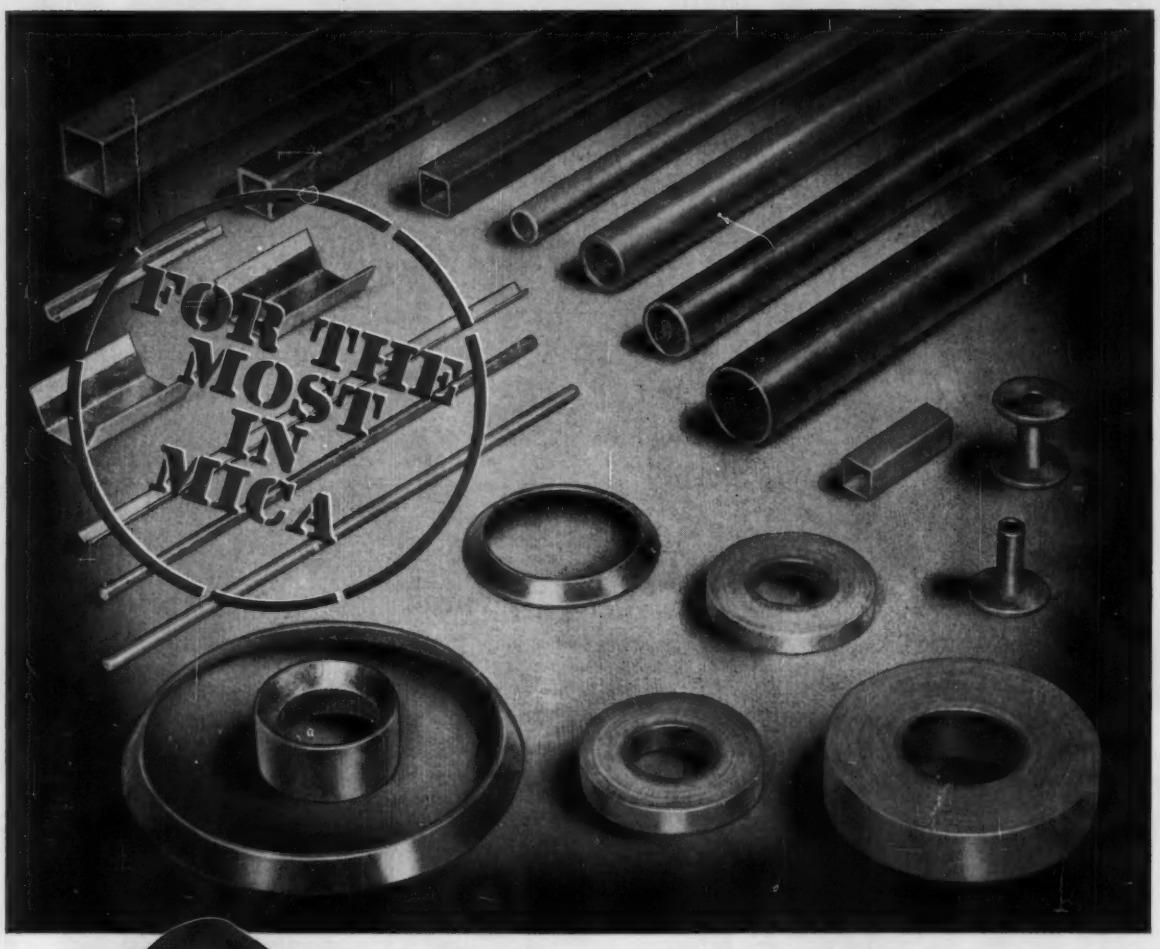

GREATEST VARIETY!

Whenever an insulating problem calls for mica, call on Macallen Mica for the correct solution. Close cooperation with the electrical industry for more than 60 years has led to the development of all mica products and combinations for every insulating purpose.

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Lighting Standards and Sign Spans by P & K blend into that pleasant "Florida Look" on the Sunshine State Parkway

An outstanding example of distinctive design and far-sighted planning, the Sunshine State Parkway may well be a model for many future traffic arteries.

From start to finish, the accent was on beauty, safety and economy, generously sprinkled with welcomed originality.

Naturally, modern thinking demanded modern materials. Clean, bright, lightweight and strong P & K aluminum products were specified and installed wherever possible... from lighting standards to over-the-road sign spans. No rust, no painting, high resistance to corrosion... and no maintenance, despite the characteristic sea air of healthful Florida.

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P & K SEAMLESS TAPERED ALUMINUM LIGHTING STANDARDS ARE INSTALLED AT ALL INTERCHANGES AND SERVICE AREAS. P & K SIGN SPANS HELP GUIDE MOTORISTS ALONG ENTIRE PARKWAY.

Bushing has a phenolic cap which covers the terminal to make it completely birdproof. Permanent connection is made quickly and easily by simply hand-tightening the knob.

Here's Why

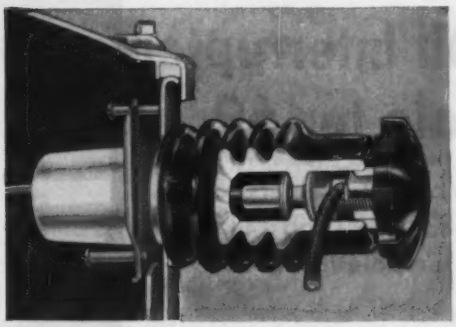
L-M Bushings Reduce Outages– Assure Safe, Easy Installation

By **R. W. HARTSOOK**
Chief Engineer
Small Distribution Transformers
Line Material Industries

Both the cover-mounted and sidewall-mounted high-voltage bushings on L-M transformers are fully insulated to eliminate outages caused by birds and animals contacting the terminal. The bushings also have a hand-tightening knob so terminal connection can be made securely, with ease and safety.

Standard Arrester Mounting

The cover bushing has a phenolic cap which covers all exposed live parts of the bushing. The cap has a drain to prevent water accumulation. When lightning arresters are installed as part of the transformer unit, they can be mounted in the regular manner and gapped through a slot provided in the insulating cap.



Cutaway view of bushing shows the heavy connector that grips the conductor. Handle cannot come off accidentally, but it can be removed intentionally.

Good Clamping Pressure

The connector knob on the bushing is large, giving plenty of leverage. A firm connection is made quickly and easily without tools or removal of any parts. Even with a gloved hand the lineman can get a good grip, so hand-tightening is all that is necessary for a permanent connection.

Bushing connectors comply with all EEI-NEMA specifications, including vertical take-off.

Sealed Against Moisture

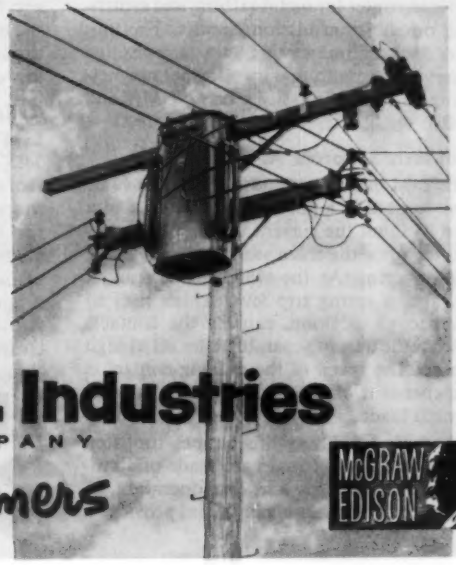
The cover bushings on L-M transformers are externally clamped to a cover boss which is raised well above the surface of the cover. Between the boss and the wide skirting of the bushing is a corprene gasket which assures excellent sealing. Surface moisture cannot flow into the bushing entrance.

A simple two-piece external clamp holds the cover bushing firmly in place. No nuts or clamping parts are used internally. The porcelain can be removed or replaced quickly and easily without removing the tank cover.

Sidewall bushing design is also leak-proof and inherently siphon-proof—moisture can't be drawn in; oil can't seep out. Sturdy internal clamping reduces the length of porcelain on the outside of the tank and thus reduces the required pole space.

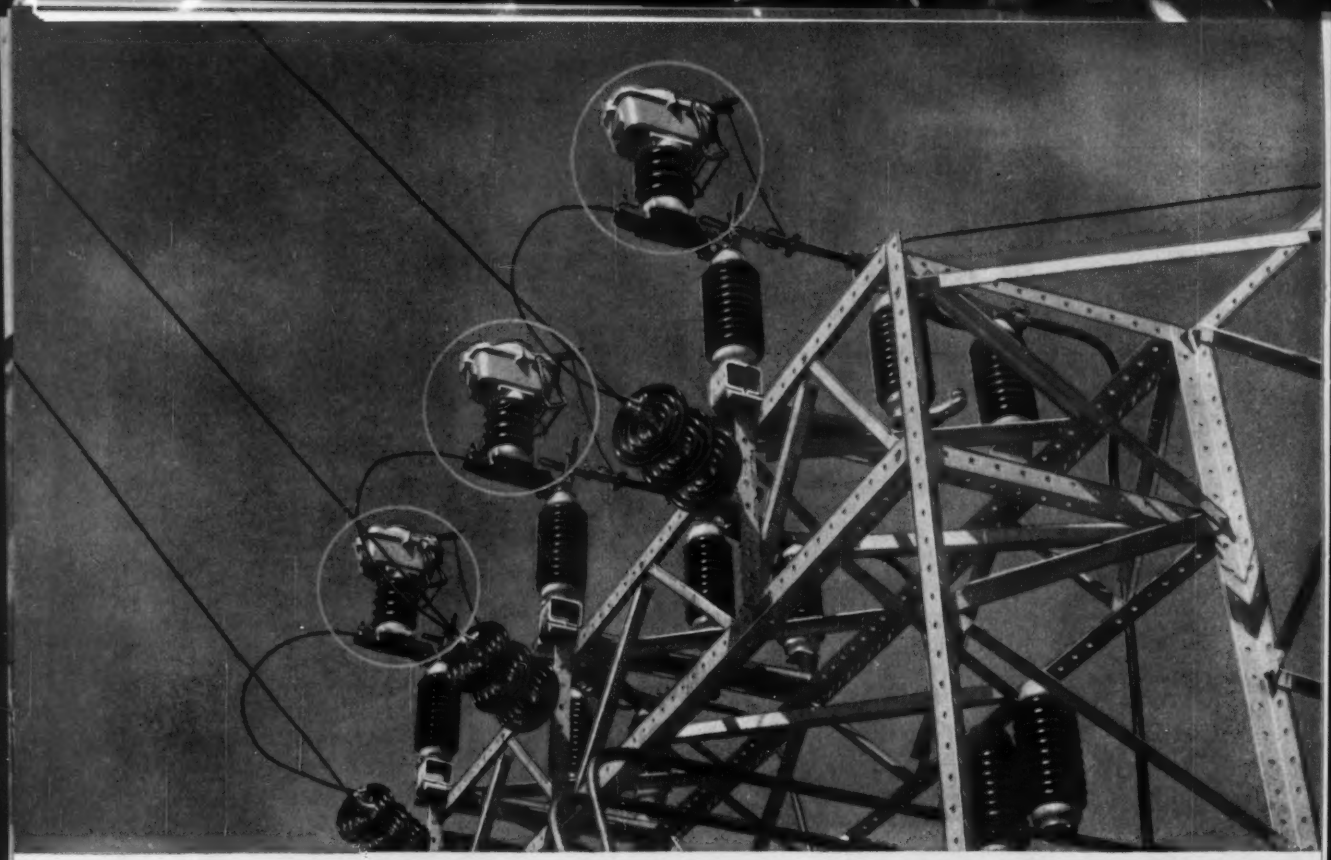
Get Complete Information On L-M's Round-Wound® Transformers

L-M's bushing design is only one of many plus features found on L-M Round-Wound transformers. The most important thing about these transformers is their outstanding performance. Ask your L-M Field Engineer for complete information and bulletins. Or write Line Material Industries, Transformer Division, Zanesville, Ohio.



LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Transformers

McGRAW EDISON



THE NEW L-M OIL INTERRUPTER provides high-speed circuit interruption on sub-transmission circuits without external arc or flame. The unit costs less than half as much as other interrupters for the same application.

New High-Voltage Oil Interrupter For Only $290 Per Pole for 69 kv

Units cost less than half as much as other interrupters for the same application—$240 per pole for 23 kv and 34 kv, $265 per pole for 46 kv, and $290 per pole for 69 kv.

Now you can get an economical, high-voltage oil interrupter for sectionalizing and switching on sub-transmission circuits. The unit is capable of interrupting load currents, line charging currents, and transformer magnetizing currents. It easily meets NEMA and AIEE standards, including the ice test.

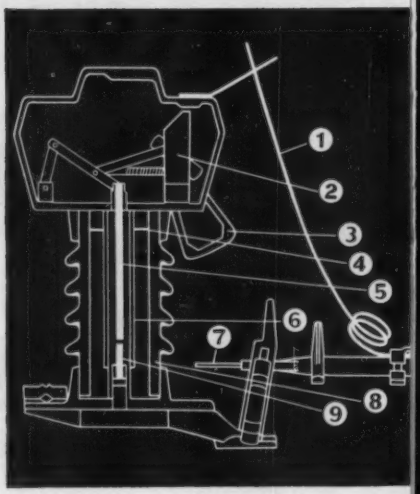
Contacts Separate At High Speed

The L-M interrupter consists of an oil-filled unit housed in a porcelain insulator, and a rod to shunt the current through the interrupter while the main switch blade is being disconnected. As the switch blade rises, it engages a spring trip lever which rises to over-toggle position, causing the contacts within the unit to separate under oil at high speed. The speed of the moving contact is independent of the operation of the main switch blade.

Contacts have long-life copper-tungsten arcing tips. All linkages are made of aluminum for lightness and fast operation. A simple fiber-washer arrangement provides a spiral passage for the pressure-generating arc, forcing oil and un-ionized gas around the arc core as the moving contact is withdrawn. This assures rapid arc extinction at low current values.

Ratings 23 kv Through 69 kv

L-M's new interrupter is available in 23, 34.5, 46 and 69 kv ratings. Continuous current rating is 600 amperes; momentary and short-time current ratings are 40,000 amps. for 10 cycles, and 25,000 amps. for 4 seconds. The unit can be installed on any of L-M's PV switches without altering the original parts. The addition of the interrupter does not change the electrical clearance or the phase spacing of the switch.



Cutaway View of Oil Interrupter

1. By-pass rod
2. Toggle mechanism
3. Trip lever
4. Oil level
5. Moving contact
6. Interrupter
7. Trip rod
8. Bushing
9. Stationary contact

Get Complete Information

Ask your L-M Field Engineer for more complete information on L-M's new high-voltage oil interrupter and on L-M's outstanding power switching equipment. Or write Line Material Industries, Milwaukee 1, Wis.

317

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

LM Power Switching Equipment

McGRAW EDISON

1957-1958: Years of Growth and Stability

Continued steady growth of electric utilities in a period of rolling readjustment that may pinch some segments of industry is the basic finding of Electrical World's eighth annual Electrical Industry Forecast.

While there will be some leveling in their economic rate of growth, electric utilities will be the least affected by mildly retarded gains in Gross National Product and industrial production foreseen for 1957 and 1958.

Basic strength of the utility position is traceable to several factors that continue to push energy sales upward.

- Continued comfortable financial position of residential customers with more income at their disposal each year to spend for electric living.
- Industry's reliance on automation and increased use of electric energy to boost productivity per worker.
- A continuing shift of population to the suburbs reflected in booming commercial building and climbing commercial usage.

Under the triple impact of these influences industry-wide sales of energy this year will climb 7.3% to 568 billion kilowatt-hours and by the end of next year to 607 billion, up 6.9%.

The push behind these increases will come mainly from residential sales where 1.2 million new customers and increased usage of 214 kilowatt-hours per customer will push 1957 sales up 10% to 147 billion kilowatt-hours. Next year's 11% increase to 164 billion reflects an expected pickup in appliances sales from the doldrums that began in late 1956.

Indications are that industrial production, static since October 1956, will also pick up later this year and boost industrial energy sales almost 6% to 292 billion kilowatt-hours. In 1958 sales to industry will increase another 4.5% to 305 billion . . . possibly more.

Commercial sales should hit 95 billion kilowatt-hours in 1957, topping last year's 88 billion by 8%. And with this year's commercial construction breaking records, 1958 should see commercial sales go to 105 billion for a 9% gain. Average annual usage should jump from 15,359 this year to 16,388 in 1958.

This December, Class I utilities should hit a peak of 113.9 million kilowatts, 11% over last December's which was unexpectedly low because of warm weather. Measured against the actual winter peak that came last January, the increase will be only 8.7%. In 1958 an expected peak of 121.8 million kilowatts would amount to a 6.9% increase over this year.

The nation's utilities will meet the December peak with a capability of 130.7 million kilowatts, but the reserve margin will be only 14.7% in spite of the 6.6% increase in capability. But record capacity additions in 1958 will push capability to 146.3 million kilowatts, up 11.9%. The margin then will be a more comfortable 20.1%. This should ease scheduling machine maintenance despite mounting summer peaks.

By the end of 1957 total utility expenditures will add to $4.6 billion. But in 1958 they will hit $5.3 billion—a whopping 13.2% increase.

Generation expenditures will increase more than 17% in 1958 to pay for 16.4 million kilowatts of new capacity. Part of this has been paid out of 1957 appropriations. But almost $2.5 billion will still be needed to put it on the line.

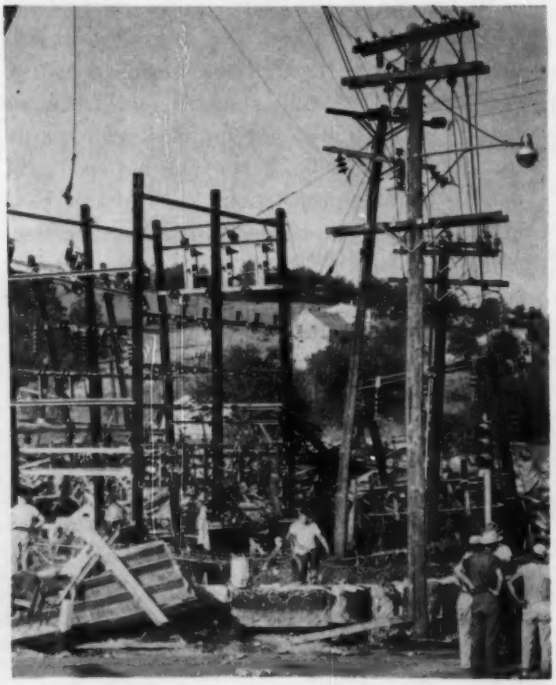
Transmission budgets for 1958 reflect the cost of linking new generating capacity to the system and strengthening interconnections. Expenditures will rise to $821 million compared to $728 million this year. Distribution plant expenditures next year will aggregate $1.8 billion for an increase of 8.5%.

Added up, these predictions paint a picture of steady growth and expansion for the rest of this year and next. They reflect the strength and stability of an industry that is the bulwark of American industrial economy.

They're Working

Thirty-day outlook is start toward the day when weathermen will be able to predict birth and path of these destructive storms which are the bane of electric utilities

Advance warning can lessen impact of heavy rains, winds, and floods



The U. S. Weather Bureau is intensifying its efforts to give you accurate predictions of what's coming during the hurricane season. This year for the first time, it began issuing regular "experimental 30-day outlooks" covering potential storms that may develop in the Caribbean area.

Some day—after weathermen strengthen their knowledge about weather and improve their data gathering and processing facilities—it may be possible for you to know well in advance, and with reasonable accuracy, whether your company must bear the brunt of a "big blow."

But right now, perfect hurricane forecasting is unlikely in the foreseeable future, says Gordon E. Dunn, the Weather Bureau's head man in its Miami office. Too many unknowns cloud the picture. Among these are the meteorological cause of hurricanes, and the factors that govern intensity, movement, and dissipation of the big storms.

Continued research will help weathermen find the answers to many questions that now puzzle them, but progress will be slow—though steady, he said.

And at the moment, there is absolutely no sound basis for believing that science can eliminate hurricanes or even modify them materially. The hopeful post-war suggestion that man might blow hurricanes apart with his mighty A-bomb is valueless. A hurricane by far is the mightier force. Figuratively it could "whip" a Hiroshima-type A-bomb blindfolded with one hand tied behind its back.

Three Tropical Storms Now Seen

The experimental 30-day outlook (prepared by the extended forecast section for the mid-August to mid-September period) says about three storms are expected to form in the Caribbean area. One should move northwestward toward the South Atlantic or Gulf states, and one should recurve northward into the Atlantic—missing the coast entirely. A third storm appears likely to develop in the Gulf of Mexico.

What Causes Hurricanes?

Weathermen don't know precisely what triggers a hurricane. They do know, however, some facts relating to a hurricane's birth. First, the hurricane starts in the trade wind of the tropical Atlantic. Here during the storm season, from August through October, there is a steady progression of weak ripples in the atmosphere. These ripples, called easterly waves, may pass a given observation point about every three days. Normally, these waves bring only a few tropical showers. But of 50 such waves occurring during a season, about 10 intensify to tropical storms and five normally build up to hurricane force.

Toward Accurate Hurricane Forecasts

Which wave will become a hurricane? That is the question. Weathermen know that these conditions must exist before a hurricane normally is born:

- Water beneath the birth spot must be comparatively warm, about 81F or higher.
- There must be a pre-existing disturbance in the tropics: An easterly wave along with a weak low-pressure system in the intertropical convergence zone or a trailing polar front in the tropics.
- Pressure must be below normal in the tropics or sub-tropics and above normal in higher latitudes, the corollary being easterly winds decreasing with height but extending 30,000 ft or higher.
- Initial disturbance must move less than 20 mph and preferably less than 15 mph.
- Initially there must be some increase in temperature instability, such as passage of warm air under a low cold zone or some interaction with a passing trough in the westerlies.

Can't Predict Intensity at Birth

Intensity of the storm cannot be predicted as it develops. According to a recent hypothesis, the maximum intensity depends upon how efficiently warm air drains off tropical cyclones, Dunn said.

Intensity of wind velocity serves as a means of classifying tropical storms. Since 1875, the U. S. has experienced 178 "tropical storms" of 40 to 74-mph wind speeds, 123 "minimal hurricanes" of 75 to 99-mph winds, 54 "severe hurricanes" of 100 to 129-mph winds, 10 "very severe hurricanes" of 130 to 149-mph winds, and six "super hurricanes" of 150-mph winds or more.

Although the statistics are a bit thin in places, New England can expect a severe hurricane every 40 years, South Carolina and Georgia one in 14 years, North Carolina one in 10 years, Middle Gulf Coast one in 7.5 years, Texas one in 5.5 years, and Florida one in three years.

Where Will a Hurricane Go?

Even after a full-blown hurricane is spotted, it is not easy to predict its direction and speed. This still remains a goal, not an achievement. Hurricane movement is complicated by the interaction of the circulation with its environment. Hurricanes usually follow wavy tracks. But at present, Dunn said, there is no way to determine whether a deviation is temporary or permanent when one occurs.

Ultimately necessary steering data may be available, Dunn told the Southeastern Electric Exchange Engineering & Operation section meeting held earlier this year in Miami. These steering data plus information on the internal forces of the storm will be fed into a computer which, it is expected, will forecast the movement with improved accuracy, he said.

In predicting hurricane movement, the forecaster seeks to evaluate the steering current, but often he's hampered by a lack of data. The storm may extend up to 60,000 ft with all sorts of forces exerting themselves upon it at various levels. Integrating these forces is impractical, so weathermen chose the 18,500-ft level as being "representative," but this is not always accurate. Acquisition of upper air forces must be obtained by reconnaissance planes. Often they are unable to obtain both the desired center fix and the peripheral steering data. The latter has a lower priority. This makes it more difficult to predict hurricane movement accurately.

Tracked Until Dead

Aircraft and radar offer the best means of detecting and tracking storms. Planes now routinely intercept hurricanes and locate their centers at regular intervals. At least two center fixes are obtained each day, and more are obtained as the storm approaches the coastline. For hurricanes moving at 15 mph or less, radar is used effectively for tracking six to eight hours prior to arrival of dangerous winds. Faster moving storms reduce the tracking time.

Hurricanes ordinarily begin to lose some of their

Hurricane Forecasting Develops Slowly

Year	Major Developments
1909	First radio report of tropical storm received from a ship
1910–20	More messages sent by ships. As advisories became more accurate, ships fled the storm area, leaving a blank space on weather map
1920's	First attempts made to forecast hurricane movement, based on surface indications and a few pilot balloon stations which provided wind direction and velocity above the surface. Commercial airline pilots reported observations up to 10,000 ft, their maximum altitude
1935	Radio-sonde observations obtained of pressure, temperature, and moisture data up to 60,000 ft and higher.
1943	First intentional flight into a hurricane proves air reconnaissance to be practical
1940's	Radar first used for detecting and tracking hurricanes. Effective range of ground radar rarely exceeds 200 mi
1956	Radar permits detection of hurricane Betsy 293 mi away
1959	Weather radar stations will be placed from Maine to Texas to provide warnings at least two hours and normally six hours in advance of the storm.

energy upon reaching land, due to increased friction. One author calculates a rate of 4% every six hours over flat terrain. Temperature and humidity also contribute to the death of the storm. Drier or colder air accelerates dissipation. But on rare occasions, unusually cold air may add power to the storm. This happened to Hazel, which blew overland for a long distance as a very severe storm.

Maximum winds in a hurricane can be predicted with reasonable accuracy after the storm has developed. However winds may vary up to 30% around the estimate.

Predicting Surge Tides

Great damage is caused by high tides, some of which surge up to 20 ft above mean low tide. Fundamental causes of such surges are the frictional drag of the wind on the water, reduction of atmospheric pressure near the center of the storm, and accumulation of water near the coast by the breaking of waves and swells. Factors producing such surges are very complex, and no complete mathematical formula for making predictions has yet been developed.

But surges may be greatly modified by velocity of the storm, the variable depth of water, the coastline shape, and the angle of the storm track with the coastline. Unfortunately the proper weight of each factor involved is not yet known. Despite this, storm tides are being forecast with a verification of about 75%.

Can't Predict Deluges Yet

Flooding from hurricane rains, often following the heavy winds, may cause heavy damage also. At present no techniques are available for forecasting rains of the magnitude of hurricanes Connie and Diane, which inflicted almost a billion dollars' damage in Pennsylvania and New England.

Even so, the processes of predicting and tracking hurricanes are improving. But because of the relative infrequency of the storms, it may be decades before meteorologists feel they have these storms licked. Meanwhile, meteorological research will continue quietly to gather the information that will make hurricane forecasts better and more accurate in the future.

Old Hydro Unit With a Mission

A Belgian Congo hospital will have daytime electric service soon from a 125-kw hydro unit that has generated power for Portland General Electric Co on a mill race in Salem, Ore., since 1938. PGE planned to junk the unit inspected here by Emory Wood, left, and Dr Donald Nelson. But when it learned of the missionary's power plight, PGE arranged a token sale for $1.

Dr Nelson estimates the unit's value to the mission at $27,000 *vs* $60,000 it would cost to buy and ship a new one to Africa. It will replace a diesel generator which operates half time because of a 70¢/gal fuel cost. The electricity will serve two schools and seven homes in addition to Conservative Baptist Foreign Missionary Society's hospital.

Memorial Honors 'Father of Traction'

The cornerstone laying above marked a salute to the memory of Frank J. Sprague, the man whose ideas led to electrically operated subways and elevators. The East Haven, Conn., building was dedicated on the 100th birthday of the inventor. It will house items on early day street cars.

Julian K. Sprague (white coat), president of Sprague Electric Co and son of the engineering pioneer, officiated at the ceremonies.

NEW 'Umbrella Coverage' Set

National Electrical Week, the observance backed by 11 of the industry's major trade associations, "will be carried out as an umbrella activity, with strong support from national advertisers" in 1958.

This is the plan announced by NEW Chairman Merrill E. Skinner, vice president and director of sales for Union Electric Co. The basic purpose of next year's February 9-15 week remains the same—"to focus attention on the contributions of electricity to our way of life."

The participation, however, promises to eclipse the three previous promotions. "Our advance contacts indicate we will have at least 250 state and local committees formed for the 1958 observance," Skinner said. Detailed reports on this year's week came from 177 state and local committees. And in some instances, an individual report covered NEW activities in more than 200 cities and towns.

"The many excellent suggestions and successful activities in these reports will form the basis for our 1958 NEW planning guide and kit of materials," Skinner said. The guides and materials will be distributed this October throughout the electrical industry.

NEW's main function, Skinner added, is "to provide a stage upon which each group and company within the industry can produce an information job of particular importance to its primary interest—whether that interest be in the field of improved wiring, a company's community relations, employee morale, the sale of merchandise, or whatever."

ATOMIC PROGRESS

NUCLEAR NOTES

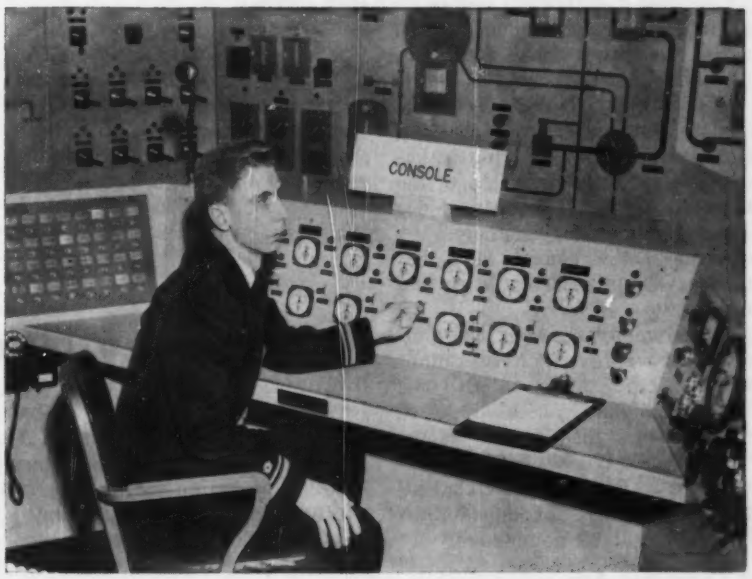
Core case delivery to Duquesne Light Co's Shippingport, Pa., plant site was completed last fortnight. The 56,000-lb stainless steel barrel was carried by truck from Westinghouse Electric Corp's Bettis Atomic Power Division. Ten separate truck loads of fuel elements have also been delivered.

A standard "dictionary" that establishes precise meanings for atomic energy technical terms has been approved by American Standards Association and published by American Society of Mechanical Engineers. The 188-page "Glossary of Terms in Nuclear Science and Technology" (AS N1.1-1957) costs $5 each. It is available from ASME, 29 W. 39 St., and ASA, 70 E. 45 St., New York.

Plans by Carolinas Virginia Nuclear Power Associates to construct an atomic reactor have been approved by Virginia Electric & Power Co, announces Pres Erwin H. Will. CVNPA, which is now seeking an AEC permit for the proposed project, is composed of Carolina Power & Light Co, Duke Power Co, South Carolina Electric & Gas Co, and VEPCO.

AEC released restricted atomic energy data to 35 firms in July under its program to make such information on peaceful applications available to qualifying firms. This brings to 1,403 the number of access permits issued since the beginning of program in April, 1955.

"Nuclear Industry Hazards" is a new non-technical booklet on industrial nuclear science which places special emphasis on radiation and its potential dangers. To order, write Chubb & Son, 90 John St., New York, N. Y.



APPR Control Features Quick Check-Up

A four-unit instrumentation system, including a console that permits Lt (jg) Walter Eager, USN, to check component operating conditions quickly, is one feature of the U. S. Army Package Power Reactor Plant at Ft. Belvoir, Va. A colorgraphic panel is flanked by panels holding full-sized indicators and recorders.

In operation since April 29, 1957, APPR is a 2,035-kw pressurized-water prototype constructed by Alco Products, Inc.

Vital TVA Post Awaits Senate Vote

Arnold Jones (right) is center of a Congressional controversy which, if not untangled, may impair TVA's operations

Meanwhile, official Washington is betting second TVA vacancy will go to Frank Walsh

The problem of solving the Tennessee Valley Authority's lack of an operating directorate hinged last week on congressional action on the nomination of Arnold R. Jones.

Jones, assistant director of the Budget Bureau, was named by President Eisenhower to fill the vacancy left by the expiration of the term of Harry Curtis last May. Since Jones' nomination, another TVA director, Dr Raymond Paty, has died leaving only Herbert Vogel and no quorum.

The situation demands action although obviously TVA operations will not halt.

Congressional sources reported that this was the situation as the Senate Public Works Committee under Sen. Robert Kerr (D-Okla.) attempted last week to complete hearings on the Jones nomination:

If Committee Acts . . .

If the committee takes no action on Jones before Congress adjourns, Eisenhower can make an interim appointment of Jones. This appointment would be good until 40 days after the new Congress meets.

If the committee turns down the nomination but the full Senate does not act before adjournment then Eisenhower cannot make an interim appointment.

What Ike Might Do . . .

If there is no action on Jones by either the committee or Eisenhower in line with the foregoing, there will be greater inducement for Eisenhower to make an interim appointment of another nominee for the Paty vacancy.

For the immediate present, therefore, the Jones hearing is the key to future action on TVA vacancies.

Should the President be forced to make an interim appointment for the Paty vacancy, the current front runner for the choice, according to congressional sources, is Frank J. Welsh, dean of the School of Agriculture, University of Kentucky.

Welsh is highly regarded in Washington, apparently by both Republicans and Democrats. Since 1953 he has been a member of the Agricultural Research Policy Committee of the Department of Agriculture and since May of this year he has been a member of the Advisory Board of the Commodity Credit Corp. He is said to be a Democrat.

'REA Policy Unchanged': Hamil

It was a stand off last week between Sen. Hubert Humphrey (D-Minn.) and Agriculture Secretary Ezra T. Benson on the question of whether REA Administrator David Hamil's lending authority has been curtailed.

For weeks Humphrey has been trying to get Benson to appear before the government operations subcommittee on reorganization. The Senator wants to question him on reports that the Department of Agriculture is now passing on all REA loans over $500,000.

Benson Willing to Talk

Humphrey charged that Benson was trying to avoid appearing before the committee. But Benson, now back in Washington after a vacation, wrote Humphrey he was perfectly willing to appear—when his schedule permitted. Benson added the further qualification that he would be willing to appear with Hamil and Kenneth L. Scott, director of Agricultural Credit Services, who, Benson admits, is reviewing the loan applications in question. Last week, however, Hamil was away on vacation. Humphrey has drawn the fire of Sen Gordon Allott (R-Colo.) who charged that Humphrey was making accusations on the basis of inaccurate press reports.

Old REA Policy Still Goes

Allott told the Senate he had discussed the matter with Hamil, Benson, and other Agriculture officials, and that there had been no basic change in REA policy.

At a press conference Benson had said the review procedure was started because of the large increase in REA loan applications and the tight budget situation.

As the situation stands now, the first REA denial of an application of any size is bound to start the whole fight again.

Fatal Safety Lapse

During a routine shutdown electrician Walter Perkins and his co-workers had completed scavenging the hydrogen gas from the generator windings of a Reed Power Station unit. Then the job remained of removing carbon dioxide, the gas which is used to force out the hydrogen. Perkins sent an assistant to fetch a "snifter" device for the recommended check on presence of hydrogen gas.

While waiting, Perkins, a 30-year veteran with Duquesne Light Co, turned on a portable, electrically driven blower used to expel the carbon dioxide and started to enter the 66-Mw generator. As he did, a spark from the blower ignited an undetected pocket of hydrogen gas. He died of burns before reaching the hospital.

He's survived by his wife, two daughters, and a son.

Pole Philanthropy

Utility poles that Cleveland Electric Illuminating Co ordinarily routed to the scrap heap went instead this summer to a nearby children's camp.

Hundreds of the discards were turned into log cabin structures and utility buildings at the camp site, which is now near completion. The poles add an authentic rustic touch, observers say.

Sunflower Gets Charter

A group of Kansas electric cooperatives has been granted a charter to set up Sunflower Electric Cooperative, Inc, a non-profit transmission firm. Co-ops at Colby, Dighton, Bird City, Norton, Wakeeney, and Scott City are the incorporators. Sunflower will serve Trego County and other counties as decided by its trustees.

'Powerland USA'

Electrical utilities of Washington State's Puget Sound-Cascade region plan to spend $1 billion in the next 12 years, according to a report sent out by Puget Sound Utilities Council of Seattle. The outlay will provide additional power to meet needs of 330,000 new citizens expected by 1969. About 37,000 industrial jobs will be needed to employ the newcomers.

The council report, "Powerland USA," calls for additional transmission lines to carry power across the Cascade Mountains to the Puget Sound area from dams now under way on the Columbia River. With 11 major dams now built or programmed on the Columbia, upstream storage—particularly in Canada—is an important element in increasing the output of downstream U.S. plants, the report emphasizes.

Seattle and Tacoma City Light, Snohomish and Chelan County public utility districts, and Puget Sound Power & Light Co are members of the council. They joined hands in 1954. In first year of power-pool operation, savings will exceed $½ million—more than eight times the council's annual budget.

Seeing Is Believing

Councilman Robert H. Miller steered his car toward the curb, stopped, and shut off his lights. He sat back, doubtful. The dark stretch of street was quiet.

Before many minutes he heard a door slam. He could barely make out the form of a man walking toward a car parked up ahead. Suddenly Miller heard a muffled cry for help. He turned on his lights. The man was surrounded by four hoodlums who quickly darted away in different directions.

Miller told his fellow councilmen about the incident. His remarks sparked particular interest. The week before, as public utilities committee chairman, he'd advised the denial of a request for a street light by citizens of the same block.

There is now a light between Barrett and Nevin Avenues on Sixth Street in Richmond, Calif.

PUD Files for 402-Mw Project

Douglas County PUD of East Wenatchee, Wash., has filed with the FPC an application for permission to build a 402-Mw hydro dam on the Columbia River at Wells, 45 mi above Wenatchee.

Preliminary studies and engineering for the $116-million project have been completed under a preliminary permit from the FPC, said William Nordeen, manager. Construction would begin one year after receipt of license and would extend through five or six years.

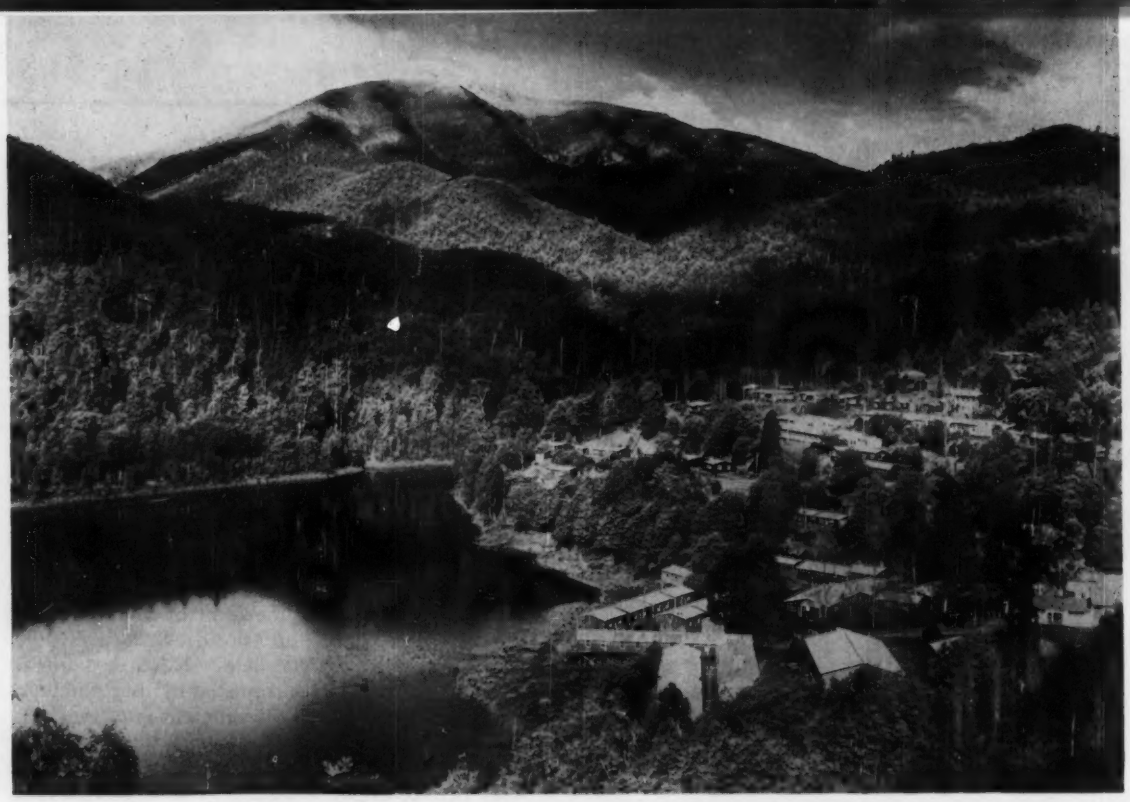
In Nashville, a 16% Increase

Consumption of electricity on Nashville Electric Service System in July totaled 135,822,620 kwhr, an increase of 16.45% over July, 1956, J. H. Tipton, assistant general manager, told the power board.

Residential usage was 55,985,852 kwhr, an increase of 11.86%.

Total electric sales for the month were $1,386,039, up 10.39%. Revenue hit $1,403,179 and operating expenses $866,962, including $571,363 for TVA power.

Other revenue deductions totaled $536,334. Of this, $80,497 was for payments of tax equivalents.



High up Bogong Village Dam holds back the Kiewa River.

Australia Stakes $1-Billion Claim on

A boom in uranium, iron, and steel industries and the ripe potential of inland irrigation are cause and effect factors behind Australia's vast Snowy Mountain scheme. The $1-billion project is designed to turn Snowy River water westward through the Great Dividing Range to the interior's dry plains. By a complex series of tunnels and power stations, the water will ultimately produce 2,620 Mw for the nation's power needs.

Includes 17 Hydro Plants

The over-all development, under auspices of the Snowy Mountain Authority, is expected to provide:

- Seventeen hydro stations, many of them deep underground, which will be the sole source of revenue to repay costs of the project.
- Storage of 4,250-million acre-ft of water behind a series of dams, seven of which are classed as "major" construction jobs and are now completed or underway.
- Yearly flow of 2.1-million acre-ft of water for irrigation.
- Water diversion by means of 330 mi of aqueducts.

The Snowy, a river originating in the mountains, flows down the Great Dividing Range eastern slope through fertile, well-watered land to the Pacific Ocean. A key section of the project is diversion of the Snowy to the Murray River (see map). To siphon off some of this water, a dam will be built forming a storage reservoir.

A series of tunnels will drain water westward from this source under the mountain range to Murray Valley, a distance of 40 mi. In a descent of 2,000 ft, the water will spin turbines at two large underground power stations with combined capacity of 1,000 Mw.

Guthage Output to Hit 90 Mw

Since February, 1955, Guthage powerhouse on the Snowy has been producing 60 Mw. Future construction will up capacity to 90 Mw. At 5,200 ft above sea level, this station has a 110-ft high dam that forms a 1,260-acre-ft pond. Water is drawn from here through 3 mi of tunnels to a point 720 ft above the river where a steel pipe line brings it down to the station.

On the other key section of the project—the Upper Tumut Development—the Eucumbene River will be checked by Adaminaby Dam, one of the highest earth and rock fill structures in the world. This will form a reservoir covering the town of Adaminaby.

Reverse-Flow Tunnel for Floods

Also feeding this reservoir through a 10-mi aqueduct will be water from the Upper Murrumbidgee River. A reverse-flow tunnel 14 mi long will divert water from the reservoir under the mountains. During floods, it can store surplus Tamut and Tooma River waters in Adaminaby reservoir for future generation and irrigation.

The first of five projects on the Tumut (T-1) will form a reservoir from which water will flow through a 1½ mi tunnel to vertical pressure shafts leading to an underground

Vast hydro and irrigation jobs progress as . . .

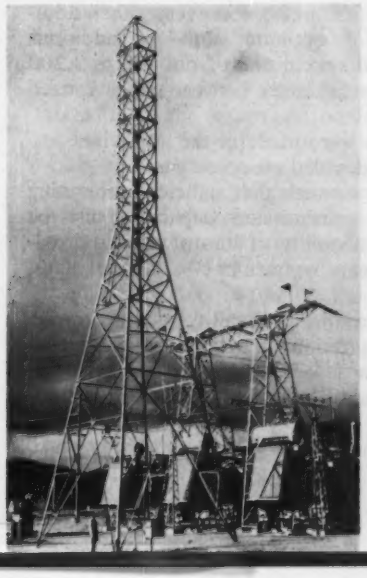
Snowy Mountain's 2,620-Mw Payload

plant. Located 1,000 ft below the surface, it will produce 320 Mw at its completion in 1959. Water will then travel through 3 mi of tunnel to produce 280 Mw at T-2 and return to the river via a 4-mi tail race.

Contractors from outside the nation are handling much of the major construction. Bids are currently being solicited for T-2 work, diversion of the Tumut to the westward flowing Tooma River, and diversion of the Upper Murrumbidgee into the Eucumbene River. These three developments are expected to cost $220 million.

U. S. Bureau of Reclamation is assisting the authority by training engineers, giving technical aid, and designing many major civil engineering structures.

TRANSMISSION LINE will link Kiewa to booming mining industries nearby



TAIL RACE TUNNEL is hewed out for Kiewa hydro plant in north-eastern Victoria. Installed capacity here will be 300 Mw; output will total 800-million kwhr/yr

In planning economic generator additions . . .

Study Effect of Area Interconnections

L. K. KIRCHMAYER, Analytical Engineering Section,
A. G. MELLOR, and H. O. SIMMONS JR, Engineering Planning and Development Section, General Electric Co, Schenectady, N. Y.

Analysis of the effect of interconnections on economic generation expansion yields these conclusions:

1. Integration of two areas through adequate transmission lines can cut system expansion costs about 15%.

2. Interconnection capacity to obtain desired system reliability is about equal to the size of the largest unit in the combined system.

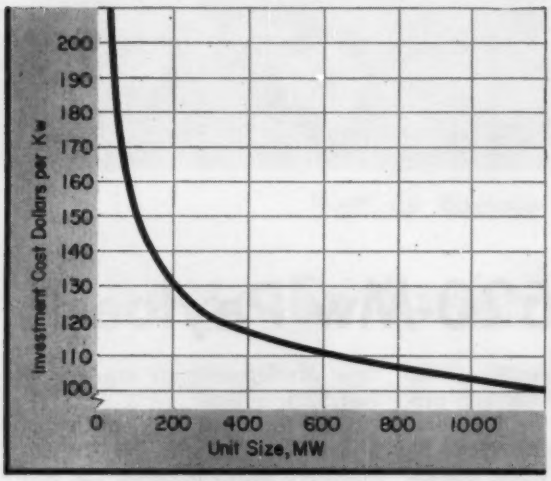


FIG 1—INVESTMENT COST is based on actual cost data up to a 200-Mw unit size, assumes reductions in larger units

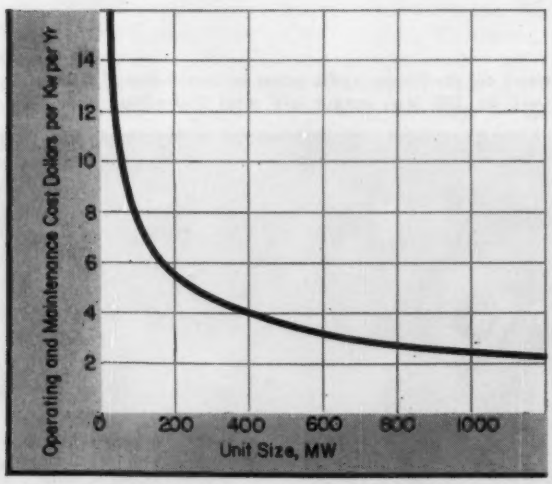


FIG 2—OPERATION COSTS including charges for maintenance are assumed to be independent of the load factor

3. Economic generator sizes range from 12 to 14% of system capacity for an initial system load of 400 Mw and decrease to 10 to 12% of system capacity for larger systems.

This analysis presents an approach to the selection of economic generator sizes for interconnected companies and notes some general trends. Although this analysis of interconnection of two equal areas is an idealized case, the results indicate what may be expected from interconnection of unequal areas.

Reserve generating capacity is essential for system reliability. Historically, generating units have been subject to about the same forced outage rate regardless of size; the larger the units, the more reserve capacity is required for the same system reliability. On the other hand, cost per kw is lower for the larger units. From these two factors comes the answer to the most economic generation expansion pattern.

Consideration of two separate operating areas suggests another relationship. Because there is a diversity of forced outages between two areas, proper integration through interconnection permits each area to operate with less reserve than otherwise would be required. An earlier study by the authors (Kirchmayer, Mellor and others, AIEE Transactions, 1955) gave a method of analysis and results of determining the optimum economic size of steam-electric generating units for a single integrated area.

Study Extended to Benefits of Area Interconnections

The present analysis extends the study to include an evaluation of the economic benefits of area interconnection with particular regard to reduced reserve capacity to cover generator outages and to optimum size additions for integrated areas as a function of initial system size and interconnection distance. A system formed by two identical areas was investigated with and without transmission interconnections. Generator additions were staggered between the areas and were chosen as a constant percent of total generation. This results in a balanced-capacity condition (equal capacity in both areas) for every other addition. Investigation of optimum unit-size additions covered various initial system loads from 400 to 3,200 Mw. Interconnection distances between areas ranged up to 200 miles.

These assumptions were made in the analysis:

Load in each area doubled every ten years.

System reliability was such that sufficient generating and interconnecting transmission capacity must be available to make probability of loss of load approximate one day in ten years, or once in 10x260 week days, which is 0.00038.

Strict adherence to this probability would require, in some cases, the addition of a large block of generation when only a few additional Mw of reserve were required. To add generating units more realisti-

cally, loss-of-load probability was assumed to increase with load to a maximum of one day in two years. Adding a large generating unit immediately decreases the probability to much less than one day in ten years. Additions were planned so that average loss-of-load probability over the period considered was approximately one day in ten years.

Further assumptions set a combined forced outage rate of 2% for the generating unit (boiler and turbine-generator). Each boiler-turbine-generator unit on the system would be down four weeks annually for planned maintenance. Weekday peak load varied through the year as a straight line from 100 to 80% of maximum peak. Forced-outage rate of the transmission system was negligible.

Costs Not Effected by Load Factor

Installed cost of generating units, including the step-up transformer, is shown in Fig. 1. Costs are based on actual data up to a 200-Mw unit size, and were extrapolated beyond this point on the basis of expected future cost reduction in larger-size units. Fixed-charges were obtained by applying an annual rate of 14%. Annual operation and maintenance costs of generation are shown in Fig 2. These costs are nearly constant regardless of the load factor at which the unit is operated.

Assumed variation in net station heat rate with unit size is shown in Fig 3. Annual cost of generation, including fixed charges, operation and maintenance, and fuel-cost differential, is given in Fig. 4. The fuel-cost differential was determined from differences between net station heat rates in Fig 3 and 9,100 Btu/kwhr, equivalent load factor of 57.8%, and a fuel cost of 25¢ per million Btu.

Cumulative dollar investment vs total Mw loading for a 100-mile transmission system expanded from two initial 115-kv circuits is given in Fig. 5. Investment dollars include installed equipment costs plus a charge for demand losses. Because interconnection capacity is established primarily for reserve purposes, transmission energy losses were neglected.

In the assumed growth of the interconnection, 230-kv circuits were superimposed on the initial 115-kv system to establish a dollars per kw cost for this next step in voltage. For specific systems, higher voltage levels—345 kv or above—may be justified at the higher loadings involved in interconnecting large areas. The $37 per kw cost was used in this analysis, even at these higher loadings, to obtain conservative results with respect to the optimum unit-size patterns.

Average dollar-per-kw investment costs during the development of the interconnection were approximated from the investment curve by two straight lines, as indicated. On this basis, an average of $58 per kw was obtained during the growth of the system at 115 kv and an average $37 per kw during growth at 230 kv. Annual fixed charges were taken as 14% of investment costs plus an annual operating and maintenance charge of 2% of investment cost.

The first step in the method is determination of the generation reserve and interconnection transmission capacity required in the system to maintain the assumed standard of reliability. These factors were considered: Size and forced-outage rate of generat-

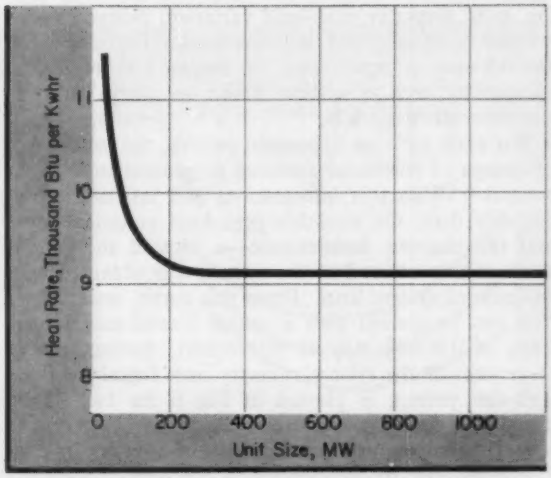


FIG 3—NET STATION HEAT RATE is assumed to vary in this manner as a function of the size of the generating unit

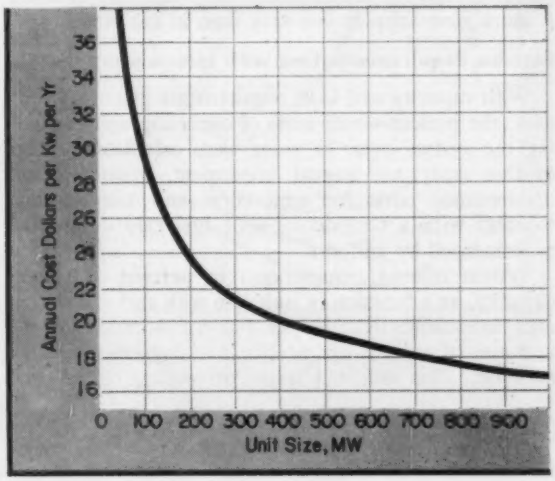


FIG 4—ANNUAL GENERATION COST includes fixed charges, operation and maintenance and fuel-cost differential

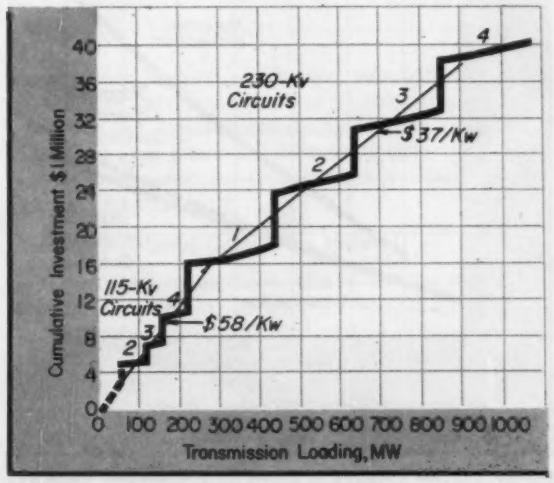


FIG 5—EXPANSION COST for a 100-mile line expanded from original two circuits includes charge for demand losses

ing units; weekday peak-load variation; planned maintenance program; and interconnection facilities. The second step is application of assumed costs to the various patterns of system design to study the relative economics of each.

For each unit-size expansion pattern, the probability of outage of particular amounts of generation was determined. With this information, and interconnection capacity data, the weekday peak-load variation curve and the planned maintenance—a plot of the probability of loss of load of the system was obtained as a function of system load. From this curve, system load that can be carried with a system loss-of-load probability of 0.00038 may be determined. System reserve in percent of the system capacity as a function of the unit-size pattern is plotted in Fig 6 for two cases. These are for no tie between the areas and for sufficient tie capacity to consider the two areas as one.

Tie-capacity requirements as a function of the unit-size pattern is indicated in Fig 7 for both the staggered and balanced capacity conditions. In the staggered case, tie-capacity requirements are increased as there is more generation in one area than in the other.

Reserve Requirements Less with Interconnections

With capacity and load requirements given for each year, the present-worth costs of operating and expanding the system over 30 years were calculated. Costs in this study are annual investment, operating and maintenance costs for generation and transmission, together with a consideration of fuel rate differential as influenced by unit size.

System reserve requirements in percent of system capacity, as a function of unit size with and without an area interconnection, are in Fig 6. Addition of the first unit of a given size results in a staggered capacity addition. This unit is a larger percentage of the total generation than the second unit of this size, which balances the system again. Consequently, percent reserve is greater for the staggered than for the balanced condition.

This effect is more pronounced for the larger unit-size patterns. These curves are based on straight-line, weekday peak-load variation from 100 to 80% with a four-week maintenance period. From Fig 6 it can be seen that use of larger unit sizes appreciably increases the advantage of an interconnection.

Present-Worth Cost Ratios Considered

Present-worth cost ratios, as a function of unit-size expansion patterns, are given in Fig 8. Each set of curves applies to the expansion from a different initial system size with and without interconnections of various distances. For each set of curves, the cost of expanding from the initial system with zero interconnection distance and a 10% expansion pattern was taken as 1.0 per unit.

The upper set of curves in Fig 8 pertains to an initial system load of 400 Mw. The upper curve in this set represents the cost ratio for the non-interconnected system; curves (A), (B), and (C) represent cost ratios for the interconnected system with tie-line distances of 200, 100, and 0 miles, respectively. Similar curves are shown in Fig 8 for initial system loads of 800, 1,600, and 3,200 Mw. These curves are based on a 100 to 80% peak-load variation and a planned-maintenance schedule of four weeks per generating unit.

It will be noted that the cost of expanding the interconnected areas, assuming a 100-mile interconnection, varies from 20 to 13% less than expanding the non-interconnected areas, assuming optimum unit-size expansions. This cost differential decreases when higher initial system loads are considered. The cost

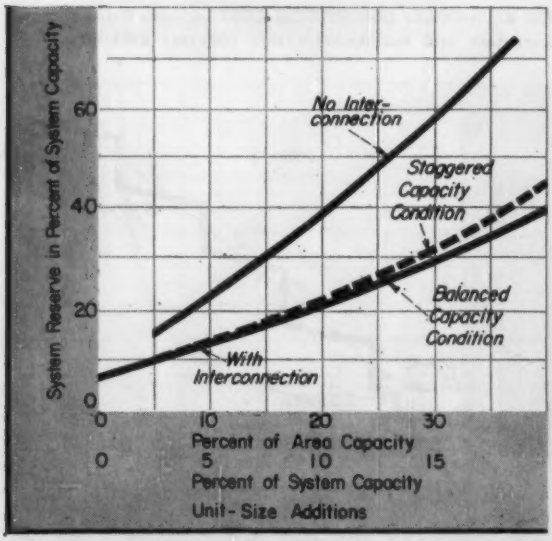


FIG 6—SYSTEM RESERVE is based on straight-line week-day peak-load variation from 100 to 80%. A maintenance outage of four weeks per machine is assumed in the study

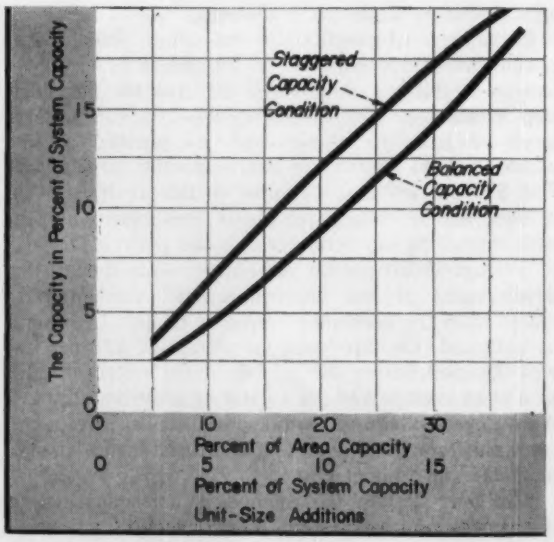


FIG 7—TIE-LINE CAPACITY is increased for the staggered-capacity condition as there will be more generation in one interconnected area than in the other for alternate steps

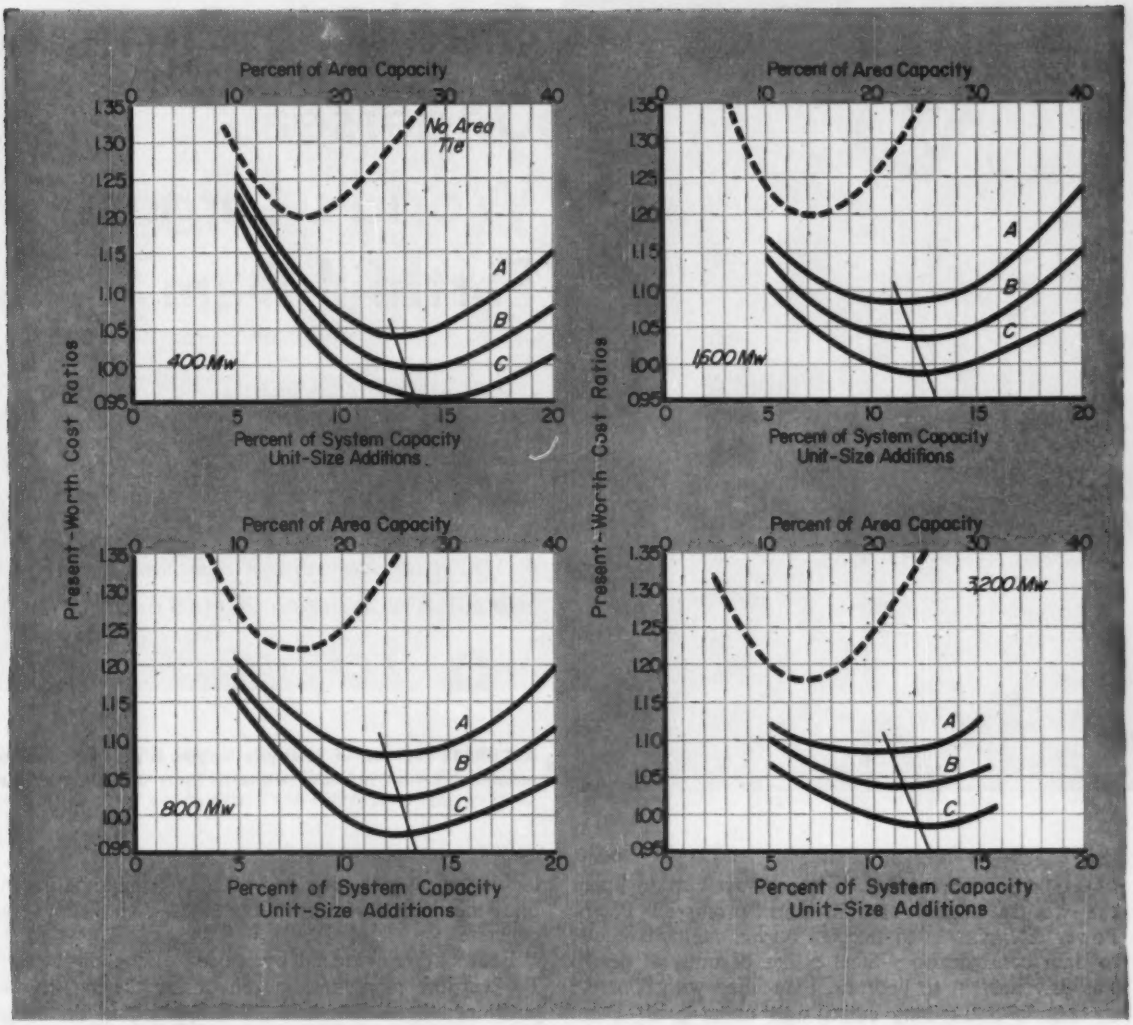


FIG 8—PRESENT-WORTH COST RATIOS are given for initial system loads from 400 to 3,200 Mw. In each case, unit-size additions are determined without an area tie and with ties of (A), 200 miles; (B), 100 miles; and (C) zero miles. Expansion cost from initial system with zero miles and a 10% expansion pattern was taken as 1.0 per unit in the study

saving is decreased about 4% when the interconnection distance is increased from 100 to 200 miles. It also can be seen that optimum unit-size expansion patterns decrease somewhat and the cost ratio curves tend to flatten out as system load increases.

It is to be noted that size of the economical addition increases for the smaller initial system loads. This increase occurs because the unit cost in dollars per kw decreases more rapidly with size for the smaller sizes.

Study Indicates An Optimum Unit Size

Optimum unit-size additions indicated by this article represent the maximum-size units to be expected in practice. Separate studies will be required for individual systems. Factors tending to favor smaller generator additions are: Increased forced-outage rates; smaller decrease in generator dollars per kw cost with size; smaller variation in daily peak load; longer planned maintenance periods; and higher interconnection costs.

Another important factor in a study of a particular system is the cost of providing adequate intraconnections. An area interconnection is of little value unless adequate transmission facilities are available in each area to support it.

Automatic Digital Computers Helpful

A foremost requirement of any electric utility is to supply load with a standard of reliability consistent with customer good will and system economics. One basis for both factors is sound patterns of generator additions. Electric utilities are encouraged to undertake analyses with assumptions pertinent to their own systems, to discover the expansion patterns most economical for their particular conditions. The authors have found automatic digital computers of great value in undertaking analyses of this nature for various electric operating companies.

Steel-Pile Curtain Underseals World's Largest Earthfill Dam

- Unique construction provides impervious barrier under the Pacific P&L Swift Dam
- 100 ft of overburden removed, then steel pile cutoff wall driven 90 ft to bedrock

ACCURATE SETTING of 55-ft pile lengths is aided by tubular template. Steam hammer waits to start driving the piles

Problems of providing an impervious curtain under the world's largest earthfill dam prompted Pacific Power & Light Co to select a barrier method unique to dam construction. Steel piling of unusual design was driven 90 ft to bedrock, then filled with concrete to form a 300-ft-long cutoff wall under Swift Dam.

This dam on southwest Washington's upper Lewis River will be 2,100-ft long at crest and 1,950-ft thick at base. It will impound 740,000 acre-ft of water in a 13.5-mile-long reservoir.

The $51-million hydro project, when completed in mid-1958, will add 204 Mw (nameplate) to the Pacific P & L system. The project includes the 510-ft-high dam and a three-unit powerhouse, called Swift No. 1. Water from its afterbay will flow through a canal and forebay to the 70-Mw Swift No. 2, now under construction by Cowlitz County Public Utility District.

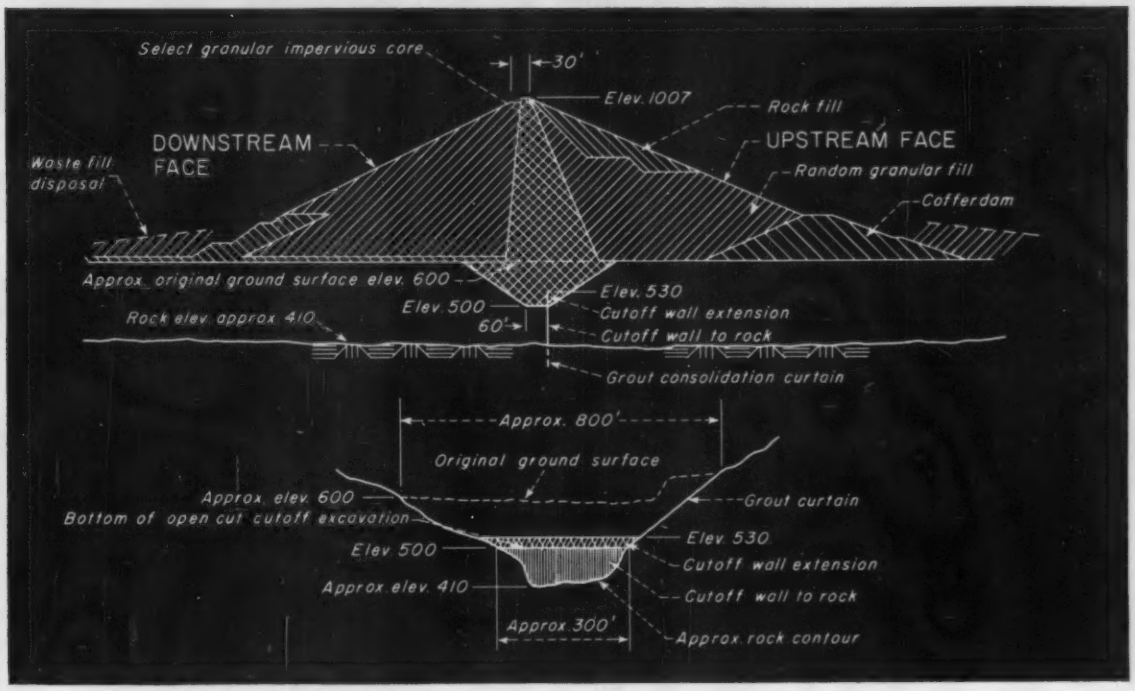
Cutoff Wall Keeps Costs at Minimum

Preliminary core samples showed that, to expose bedrock for conventional sealing, overburden as deep as 200 ft would need removal. But economic evaluation proved that costs could be held to a minimum by removing only about 100 ft of burden and then driving a steel pile cutoff wall the remaining distance to bedrock. This evaluation included cost of handling water inflow during open-cut operations.

The need for a pile which could be filled with concrete, yet driven through rock, was satisfied by a European design never used previously in dam work. The pile consists of a wide-flange H-beam with interlocking sheet piling welded to each flange. Adjacent piles interlock to form 15 by 18-in. cell sections for concrete.

Bedrock was reached by splice-welding 55-ft piles. To keep the piling interlocked during driving, it was positioned by a tubular steel template and driven to bedrock with less than 5-ft lead between adjacent piles. No unusual driving problems arose, as the area below elevation 500 was fairly free of large boulders (sketch). Some jetting was required during the early stages.

AFTER CLEANING pile cells, drill probes below selected piles to confirm that the wall has penetrated the bedrock



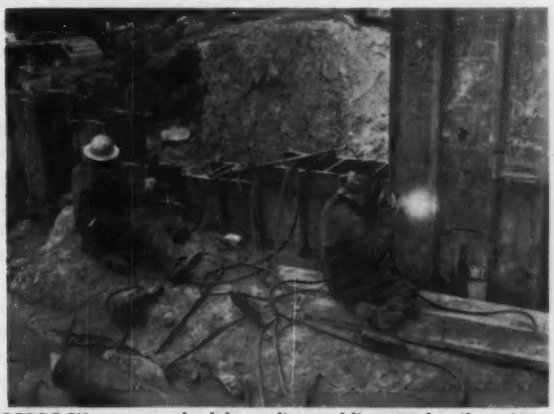
STEEL CUTOFF WALL and its concrete extension are shown in relation to dam in section parallel to stream flow (top). A million cu yd of overburden up to 100 ft deep was scraped out of the pit to elevation 500, clearing way for steel-pile cutoff wall to be driven 90 ft to bedrock. Cutoff wall extension lengthens seepage path through core of the dam

Stream-bed materials that collected within the pile cells were pumped out with an air pump. A drill rig then probed sample cells to check whether the wall penetrated bedrock. The drill holes were used also to pour consolidation grout into the bedrock. All cells were filled with tremie concrete.

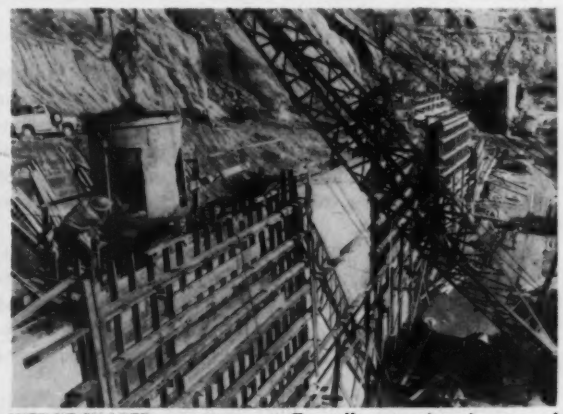
Next phase was building of a 30-ft wedge-shaped concrete extension atop the piling. This wall extends into the main dam core to minimize seepage further.

Placement of impervious fill for the dam core was begun while the wall extension was under construction. Gaps left in the wall permitted simultaneous fill operations.

By mid-July the wall extension was completely covered by fill, and the floor of the foundation zone was rising 2 ft per day. Over 10% of the 15.3-million cu yd of fill required for the dam had been placed. A 450-ft 5-span bridge over the river was under construction. And steel cylinders for the 1,530-ft power tunnel were being positioned.



BEDROCK was reached by splice-welding 55-ft piles. Note 15 by 18-in. cell sections formed by interlocking flanges



WEDGE-SHAPED concrete cutoff wall extension is poured atop piling. Wall taper ensures tight contact with fill

Grounded and Floating-Wye Banks Compared on 11 Counts

Considerations	Grounded Wye	Floating Wye	Comments
Insulation	No neutral-to-ground insulation needed	Neutral-to-ground insulation must equal system BIL	
Fusing	Fuse selection simplified —fault current limited only by system impedance	Fuse link must clear in 300 sec or less at 95% of 3 times rated bank current	Group-fusing desirable for economy, convenience
Delta systems	Not recommended	May cost less than delta-connected banks because of lower voltage capacitors	
Unusual voltages	No phase reversal, serious overvoltages or undervoltages when one phase opened	Can produce serious overvoltages, undervoltages, or phase reversal when one phase opened	Effects minimized by 3-phase sectionalizing on source side
Feedback	No feedback when one phase opened	Can feed phase-to-ground loads at half voltage when one phase opened	Effects minimized by 3-phase sectionalizing on source size
Recovery voltages	Recovery voltage moderate on switchgear	Recovery voltage sometimes high on switchgear	
Surge voltages	Low-impedance path to ground beneficial to system	No path to ground for surges	Grounded-wye banks assist nearby lightning arresters
Available fault current over 4,000 rms amp for 25-kvar or 5,000 rms for 50-kvar units	Requires current-limiting fuses	Limits to 3 times rated bank current. Therefore, amount of available fault current is not important. Group-fusing can be used	Floating-wye more economical than individual current-limiting fuses
Triple harmonics	Provides low-impedance path to ground	No path to ground for triple harmonics	
Inductive interference	Can result from harmonic currents; usually net serious	No inductive interference	Usually easily corrected; minimized by modern communication equipment
Neutral voltage	Fixed at ground potential	Shifts under unbalanced conditions	

Grounded-Y Better for Capacitors

HAROLD STONE, Development Engineer, Line Material Industries, Milwaukee, Wisc.

Ease of fusing and freedom from undue voltage variations, feedback, and phase reversal are some advantages gained by using solidly grounded wye-connected capacitor banks. Although the grounded-neutral connection is widely used, it is sometimes avoided because of concern over possible communication system interference.

Relative merits of grounded and floating-wye connections are tabulated above. The table applies particularly to relatively small group-fused banks and shows considerations applying to the neutral only. Grounding of tanks or supporting framework is not considered.

Grounded-wye banks provide a low-impedance path to ground for harmonic currents which can cause interference through coupling with communication circuits. However, communication equipment now used in most urban areas is not overly susceptible to power system interference.

Where interference occurs, it can be eliminated frequently by relatively simple measures: A slight change in the location of the bank; balancing kilovars on single-phase taps; or, using filters in the phase or neutral connection. On the other hand, communication system susceptibility can be reduced by transposing communication circuits, using the shielding of cable, or replacing obsolete equipment.

Grounded or floating-wye banks can be applied on wye-connected circuits where available fault current is as great as 4,000 rms amp for 25-kvar capacitors or 5,000 rms amp for 50-kvar capacitors. Floating-wye banks are suitable also for use on delta systems or where available fault current exceeds allowable limits.

8th Annual Electrical Industry FORECAST 1957-1970

ARTHUR J. STEGEMAN, Manager, Market Research

●This is a completely new electric utility industry forecast based on an up-to-the minute diagnosis of the health of the American economy. And while there are many changes from last year, the sum total of this year's findings continues to spell out steady growth for electric utilities.

Many changes reflect the current, cautious attitude towards the near-term business outlook as compared with the unbridled enthusiasm running rampant at this time last year. This can be seen in our economic forecast provided by the McGraw-Hill Department of Economics.

Projections of Gross National Product and industrial production for 1957 and 1958 show more temperate gains than those registered during the boom years of 1955 and 1956.

But while this temporary slowdown will pinch some segments of industry, electric utilities will be among those least affected.

Increasing residential consumption resulting from appliance purchases and greater industrial use of electric energy to increase labor productivity assure the industry of steadily increasing sales during this period of "rolling readjustment." Basically these gains will be provided by continued growth in consumer disposable income and a sustained high level of industrial capital expenditures for new plant and equipment.

Actually this leveling off in our economic rate of growth is what we expected at this time last year—the only difference is in the timing. You can see this in our new forecast for utility sales in 1960. They come very close to matching last year's forecast.

And why shouldn't they. Over the long-range, population increases coupled with a higher standard of electric living will at least duplicate the growth of the electric utility industry over the past decade.

Economic Outlook ..... p 92
Residential Kwhr Sales ..... p 94
Industrial Kwhr Sales ..... p 97
Commercial and "Other" Kwhr Sales ..... p 101
Energy Production and Peak Loads ..... p 103
Capability and Utility Budgets ... p 104

Population Rise Is Base . . .

Population growth will continue as a mainstay of our expanding economy. Even now, with the low level of family formations reflecting the baby drought of depression years, we are adding to our population at the rate of 2.9 million persons a year. This is considerably above the average annual growth of 1.6 million chalked up between the turn of the century and 1956.

But even this rapid growth will be surpassed during the 1960's when children of the post World War II baby boom unite to set up housekeeping. This new surge in family formations, coupled with an even higher standard of living than we now enjoy, will set consumer spending skyrocketing.

In the late 1960's our population will swell at the rate of better than 3.5 million a year. A good part of this growth will be provided by new families, and the remainder by our ever-lengthening life span brought about by modern conveniences and medical research.

Adding up these annual increases leaves us with a population of around 212.7 million people by 1970—an increase of more than 26% over 1956.

Will Boost Family Units

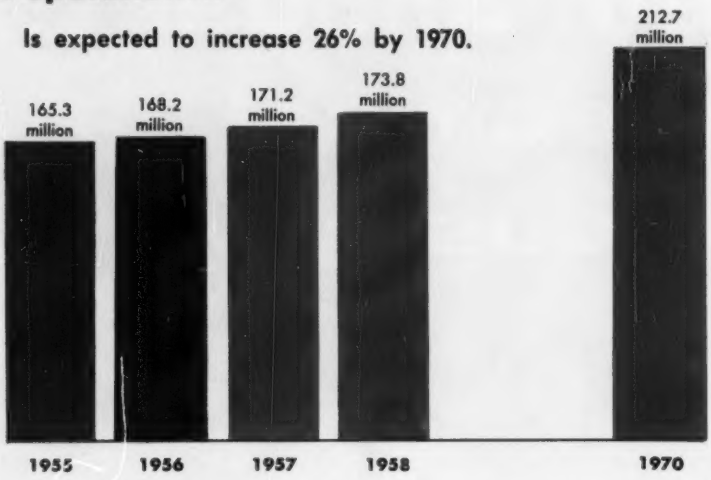
Household totals will reflect this population growth. By 1970 household units will be growing at the fastest rate ever. Here again new family formations and an increasing number of older household units will provide the push.

Between now and 1970 households will increase by 34% to a level of 67.9 million units. That means 17.2 million new units for a 41.5 million increase in population.

New home construction will have to keep pace with household growth. Providing shelter for our booming population in 1970 will require 1.6 million housing starts each year. This is the minimum requirement.

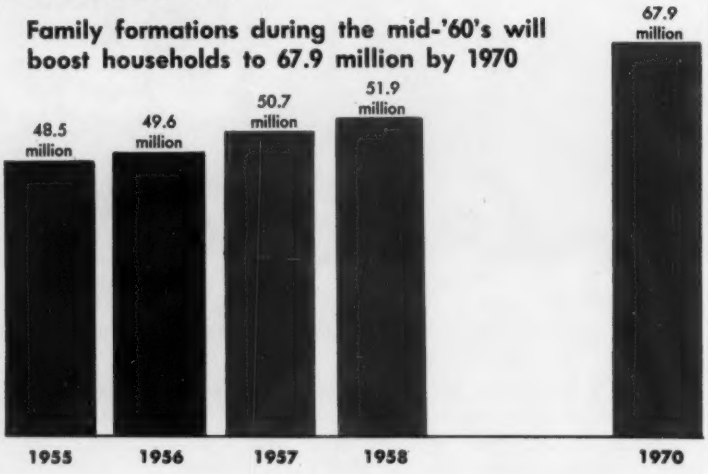
Population...

Is expected to increase 26% by 1970.



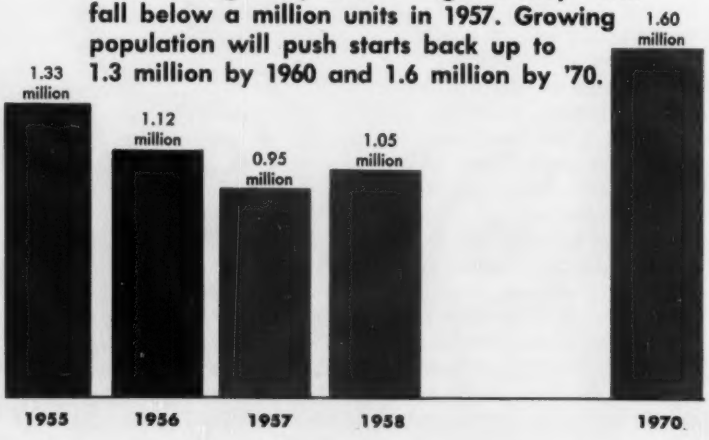
Households...

Family formations during the mid-'60's will boost households to 67.9 million by 1970



Home Building...

Now feeling the pinch of "tight money" will fall below a million units in 1957. Growing population will push starts back up to 1.3 million by 1960 and 1.6 million by '70.



For 62% GNP Climb by 1970 . . .

This figure can easily be boosted by the vast number of older homes that are coming due for replacement each year. Add to this a continued trend towards decentralization of population, the many thousands of homes to be demolished by new highways, and the possibility of an increasing number of two-home families, and you find that 1.6 million new homes a year may be wholly inadequate.

This year the home-building industry is caught in the squeeze of a "tight money" policy and the low level of family formations. It appears that housing starts will just hit 950,000 units in 1957. Yet, the worst appears over. With a backlog of demand building up and Congress moving to ease the mortgage situation, it appears that home construction will bounce up to 1,050,000 units in 1958, to 1,200,000 in 1959 and 1,275,000 in 1960.

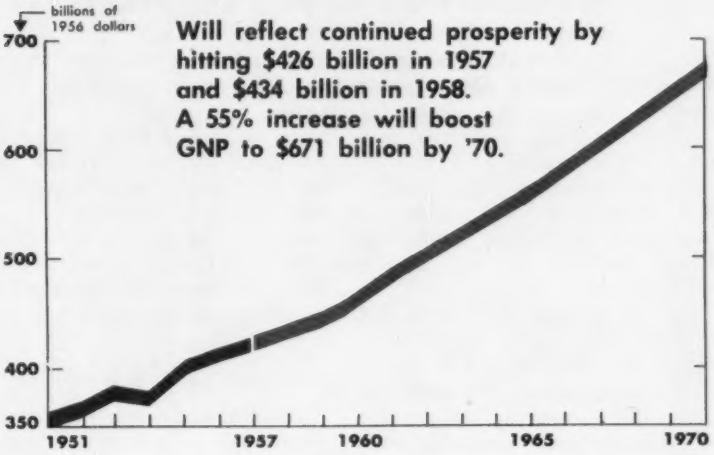
GNP Up 2.7% In '57

The nation's overall output of goods and services (Gross National Product) continues to increase despite soft spots in the economy. For this year GNP will show a 2.7% gain over 1956's $414.7 billion. For 1958 economists forecast a moderate 1.9% gain over this year's $426 billion, pushing '58's level to $434 billion.

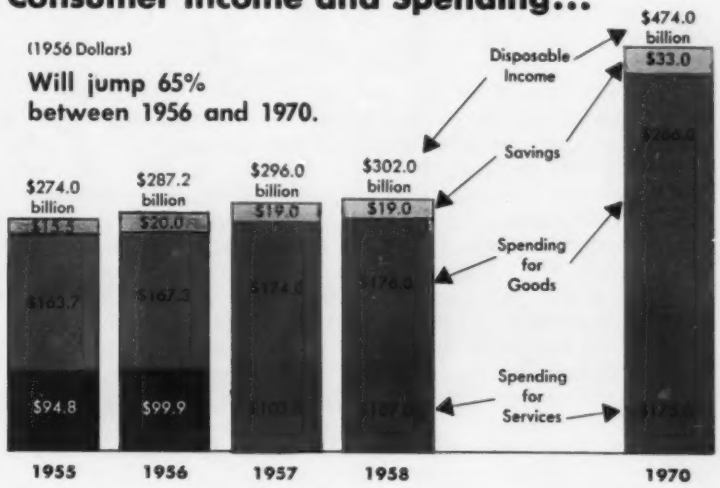
Subsequent years will witness greater annual increases in GNP. Providing goods and services for our 1970 population will require a GNP of $671 billion—62% more than last year for an average rate of growth of 4.4%. This will require many "boom" years such as 1955 when the increase was 7.3%.

Consumers will spend $296 billion of this year's GNP on goods and services. That's 3.1% more than last year, suggesting that most consumers should be in a very comfortable financial position. In 1958 consumer disposable income will gain another $6 billion, or 2%. But

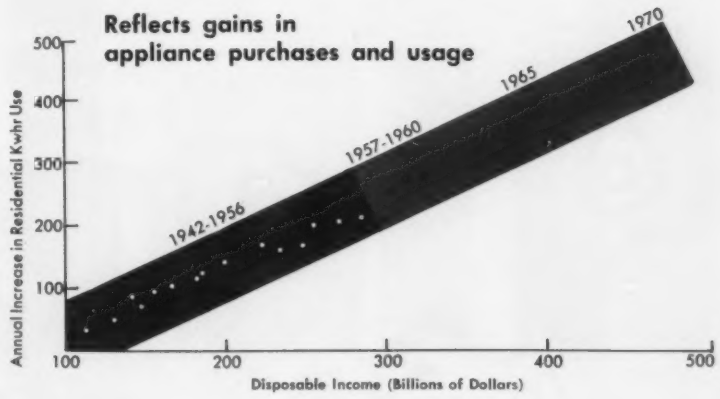
Gross National Product...



Consumer Income and Spending...



Increase in Average Home Use vs Consumer Disposable Income



. . . and Steady Residential Growth

between 1958 and 1970 this figure will climb 57% to 474 billion a year.

While it's true that a greater part of 1970's consumer disposable income will reflect our larger population, a good part of it will be the product of our higher standard of living. Last year per capita disposable income averaged $1,707. In 1970 the average will be $2,228 per person—almost 31% more than 1956. It's a safe bet to assume that a good part of this added income will be spent on labor-saving electrical devices—some considered luxuries today and some not even dreamed of.

More Residential Customers

Electric utilities won't experience any great surge in new residential customers for the next few years. The low birth rate of the 30's and the consequent low level of family formations we are now experiencing will see to that. But even so, residential customer additions between now and 1960 will be quite substantial. In both 1955 and 1956 utilities added around 1.3 million new customers a year. This year we are heading for another 1.2 million increase, which will boost total residential customers to 46.9 million. Annual additions will stay at this level until around 1960.

Beyond 1960, residential customer additions will start to pick up. Once again, we can give credit to the post World War II baby boom which will be increasing our household units at a record rate. Increases during the 60's will push total electric utility residential customers to 64 million by 1970—40% more than at the end of 1956. Around 1970 we will be adding 1.4 million residential customers a year or better.

Appliance Sales Mean Kwhrs

Both old and new residential customers will be able to take better advantage of the comforts of electric living by 1970. More people with more spending money (consumer disposable income per capita will be up 31% to $2,228) means greater usage of the comforts and advantages of electric living, such as year-round electric heating and cooling, electric water heating, and electric cooking.

Ignoring the many other electric conveniences now available and the many that will be developed between now and 1970, it's conceivable that the average residential customer could easily consume better than 15,000 kwhr per year by 1970. That's 405% more than he used last year.

However, our actual forecast is considerably more conservative. In fact, it can be considered a minimum. In 1970 the average annual residential use of electric energy will hit 7,901 kwhr—an increase of 166% over 1956.

In 1957 the average residential customer will use 7.2% more electricity than the 2,969 kwhr he consumed last year. Next year average use will increase another 261 kwhr to a yearly total of 3,444 kwhr. Both years will reflect increased usage of appliances already owned by the consumer. Next year's figure anticipates a pickup in appliance purchases which have been in the doldrums since late 1956.

Sales 11% Higher in 1958

New residential customers and increased usage will combine to push 1957 residential sales up 10% to 147 billion kwhr. Next year's sales will be 11% higher, ending up the year at 164 billion kwhr. But by 1970 with average annual use at 7,901 kwhr, residential sales will total 501 billion kwhr—206% more than 1958.

The average cost of electricity to residential customers will continue to go down. Consumers themselves will be mostly responsible because of their increased usage. This year, residential customers will pay an average of 2.56¢ per kwhr for electricity—1.5% less than last year. By 1970 the cost will drop another 10% to 2.3¢ per kwhr.

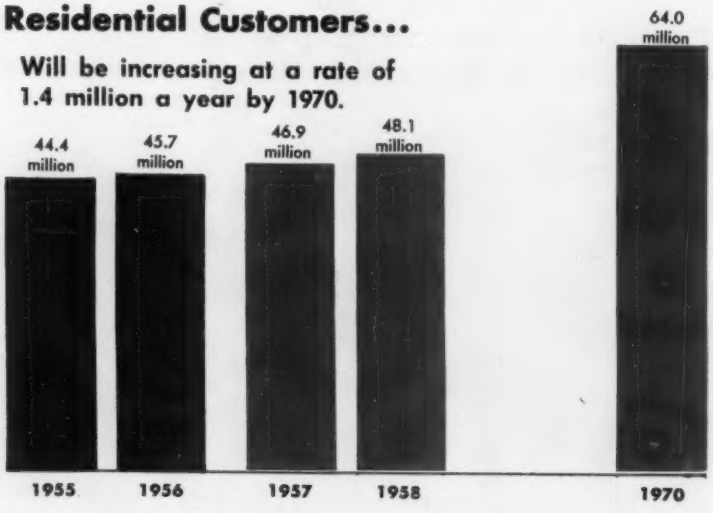
But while increased usage lowers the average cost per kwhr to the residential customer it will also raise his average annual bill. This year the average bill will increase $4.29 to $81.48—about 4.7% of average per capita disposable income and just about even with the average families' cost of owning and operating an automobile for one month.

In 1970 the average residential bill will be almost $182—123% more than this year, yet still only about 8.2% of average per capita disposable income.

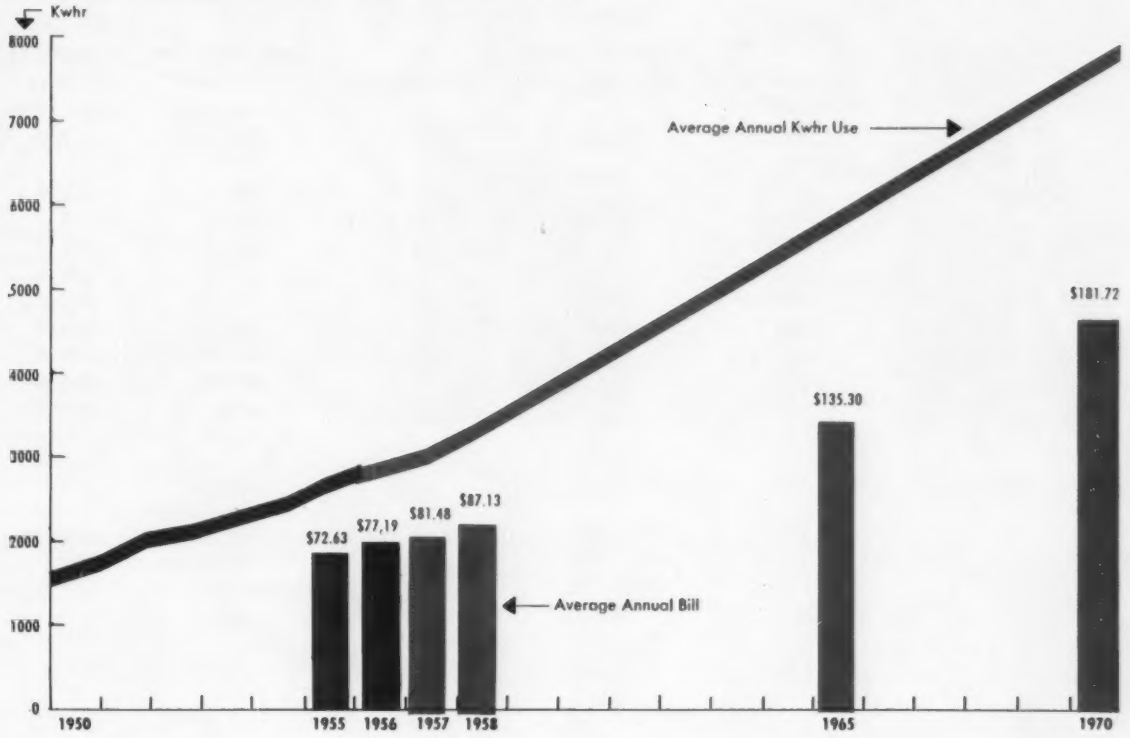
Revenues from residential electric service will total $3.8 billion in 1957—a gain of 8.5% over last year. Next year they will jump 9.7% to $4.1 billion. By 1970 this will be increased by another 178% to $11.5 billion.

Residential Customers...

Will be increasing at a rate of 1.4 million a year by 1970.

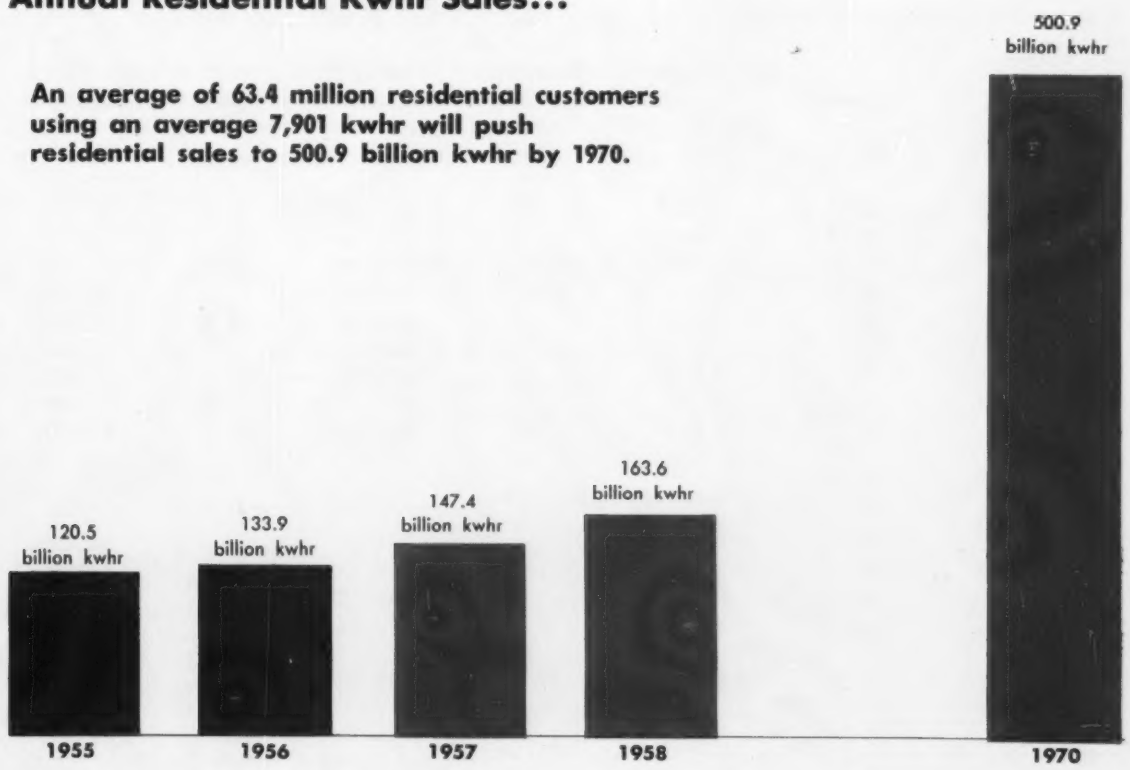


Residential Average Use & Bill...



Annual Residential Kwhr Sales...

An average of 63.4 million residential customers using an average 7,901 kwhr will push residential sales to 500.9 billion kwhr by 1970.



More People With More Spending Money Will . . .

	Population	New Nonfarm Dwelling Units	Households	Gross National Product	Consumer Disposable Income
	million	thousand	million	billion 1956 dollars	billion 1956 dollars
1948	146.6	932	42.2	302.7	212.0
1949	149.2	1,025	43.6	301.8	214.6
1950	151.7	1,396	44.4	329.9	232.9
1951	154.4	1,091	45.3	354.2	236.5
1952	157.0	1,127	46.1	366.6	242.7
1953	159.6	1,104	46.7	381.6	254.0
1954	162.4	1,220	47.4	375.0	257.3
1955	165.3	1,329	48.5	402.5	274.0
1956	168.2	1,121	49.6	414.7	287.2
		FORECAST			
1957	171.2	950	50.7	426.0	296.0
1958	173.8	1,050	51.9	434.0	302.0
1959	176.6	1,200	53.1	446.0	310.0
1960	179.4	1,275	54.4	466.0	325.0
1965	195.3	1,400	60.9	560.0	390.0
1970	212.7	1,600	67.9	671.0	474.0

Raise Average Residential Use to 7,901 Kwhr in 1970

	Customers	Use per Customer	Revenue per kwhr	Average Annual Bill	Sales	Revenue
	millions	kwhr	cents		billion kwhr	million dollars
1948	33.5	1,563	3.01	$47.05	51.0	$1,533
1949	35.4	1,684	2.95	$49.68	58.1	$1,717
1950	37.5	1,830	2.88	$52.70	67.0	$1,932
1951	39.2	2,004	2.81	$56.31	77.0	$2,165
1952	40.7	2,169	2.77	$60.08	86.8	$2,401
1953	42.0	2,346	2.74	$64.28	97.1	$2,659
1954	43.1	2,549	2.69	$68.57	108.5	$2,920
1955	44.4	2,751	2.64	$72.63	120.5	$3,187
1956	45.7	2,969	2.60	$77.19	133.9	$3,477
			FORECAST			
1957	46.9	3,183	2.56	$81.48	147.4	$3,773
1958	48.1	3,444	2.53	$87.13	163.6	$4,139
1959	49.3	3,727	2.50	$93.18	181.5	$4,538
1960	50.5	4,024	2.47	$99.39	200.8	$4,960
1965	57.0	5,709	2.37	$135.30	322.0	$7,631
1970	64.0	7,901	2.30	$181.72	500.9	$11,521

8th Annual Electrical Industry Forecast

Industrial Output to Keep Pace . . .

Increasing industrial production to provide the total output of goods and services required by our swollen population in 1970 is not going to be easy. It is estimated that our higher standard of living, as represented by a GNP of $671 billion in 1970, will require a 60% increase in industrial production.

But while our swelling population will give the impetus to this expansion in output, it will not provide the working force needed to reach this production level. From the mid-60's on, our population will grow at both ends of the age scale but shrink in the middle. The shrinking segment, of course, is the source of our labor force. Compounding the squeeze in the labor force will be the shorter work week.

Manpower Will Be a Problem

This means that a 24% increase in employment by 1970 will only yield a 13% increase in manhours. The effect of this pinch in manhours can be illustrated in terms of output per manhour.

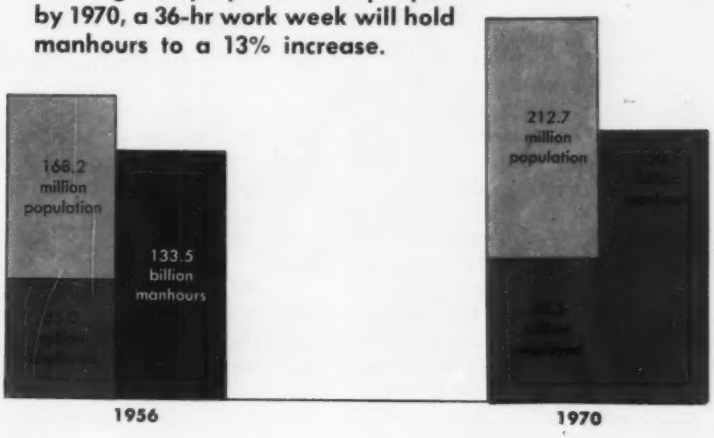
In 1956, 65 million workers on the job 39.5 hr a week, 52 weeks a year produced $414.7 billion of Gross National Product. That meant that each manhour worked had to provide $3.11 of national product. But in 1970 only 80.5 million workers will be available for a 36-hr work week to produce $671 billion of GNP. In that year each worker will have to produce $4.45 of goods and services each hour on the job.

Our biggest challenge will be to increase our output per manhour. And since productivity increases in service functions are rather difficult to achieve, we will have to concentrate on making further gains in industrial productivity.

The challenge to our continued economic growth will come in 1970, when industrial production will hit 232 on the FRB's index—62% more than last year with available

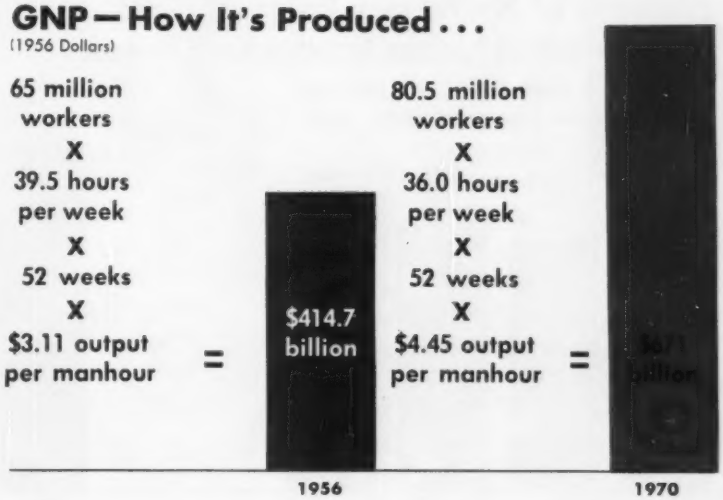
Population and Employment...

Although employment will jump 24% by 1970, a 36-hr work week will hold manhours to a 13% increase.



GNP — How It's Produced . . .

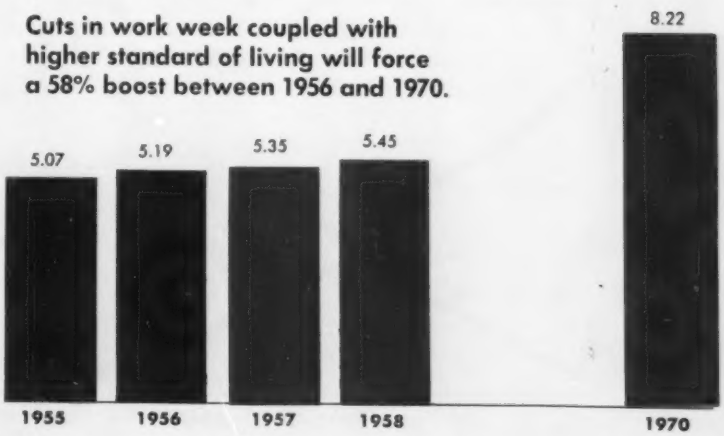
(1956 Dollars)


65 million workers X 39.5 hours per week X 52 weeks X $3.11 output per manhour =
$414.7 billion
80.5 million workers X 36.0 hours per week X 52 weeks X $4.45 output per manhour =
1956
1970

Manufacturing Productivity . . .

(Points of FRB index per billion manhours.)

Cuts in work week coupled with higher standard of living will force a 58% boost between 1956 and 1970.



. . . With Big Boost from Automation

manhours up less than 5%.

With this situation on the horizon, industry has already started to head off future manpower shortages by turning more and more to automation or increased use of electric energy by production workers.

Greater use of electricity will stretch our limited labor supply. This year a billion manhours will provide 5.2 points of the manufacturing production index. By 1970, the same amount of labor will provide 8.2 points, meaning that labor productivity will register average gains of about 4.4% a year between now and 1970.

In terms of electric energy, this will mean the use of 2,163 million kwhr per point of the manufacturing FRB in 1970 as against 1,688 million kwhr per point this year—a gain of 28% in energy used per point.

Use of electric energy in production has been steadily increasing for years. In 1950, the average production worker eased his chores by using 6.1 kwhr for each hour on the job. By 1956, he was using 8.4 kwhr per manhour or 38% more. By 1970, he will be using 17.9 kwhr—113% more than last year.

With production workers' use of electricity on the upswing, we can count on substantial increases in the manufacturing use of electric energy. In 1957, manufacturing use will total 248.1 billion kwhr for a gain of 6.7% over last year. A manufacturing index of 150 in 1958 will move this up another 4.4% to 259 billion kwhr.

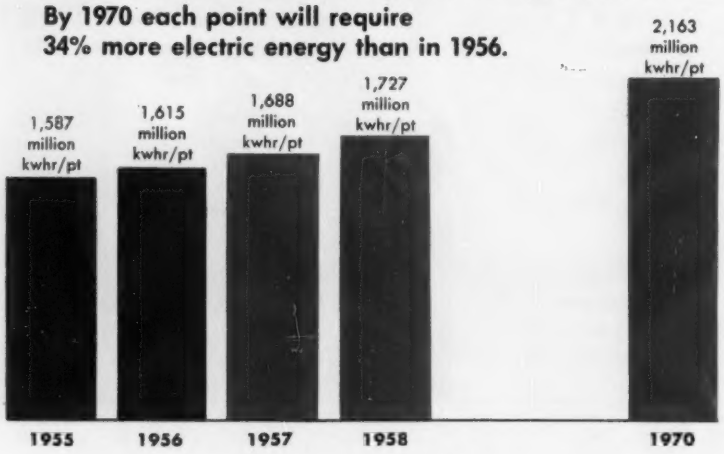
With kwhr use per point of production up 28% by 1970 and manufacturing running at the 236 level, we can expect manufacturers to use almost 511 billion kwhr a year—106% more than 1957.

Aluminum and magnesium producers will use only slightly more electric energy this year than in 1956 due to a lull in consumer demand for aluminum.

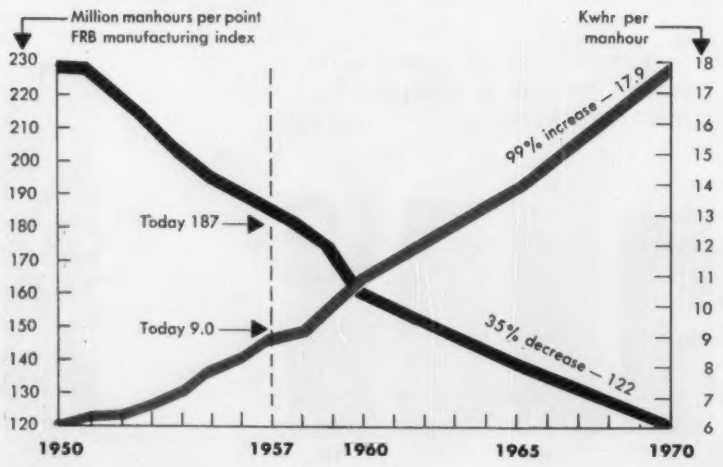
However, aluminum forecasters consider this a temporary condition as evidenced by the industry's expansion plans. With production of aluminum and magnesium picking up again next year, we can expect these industries to use almost 37.5 billion kwhr or 19% more than last year. By 1970 production of 3.7 million tons of aluminum and 300 tons of magnesium will require 71.9 billion kwhr of electric energy.

Millions of Kwhr per Point of the Manufacturing Production Index . . .

By 1970 each point will require 34% more electric energy than in 1956.



Manhours vs Kwhrs . . .

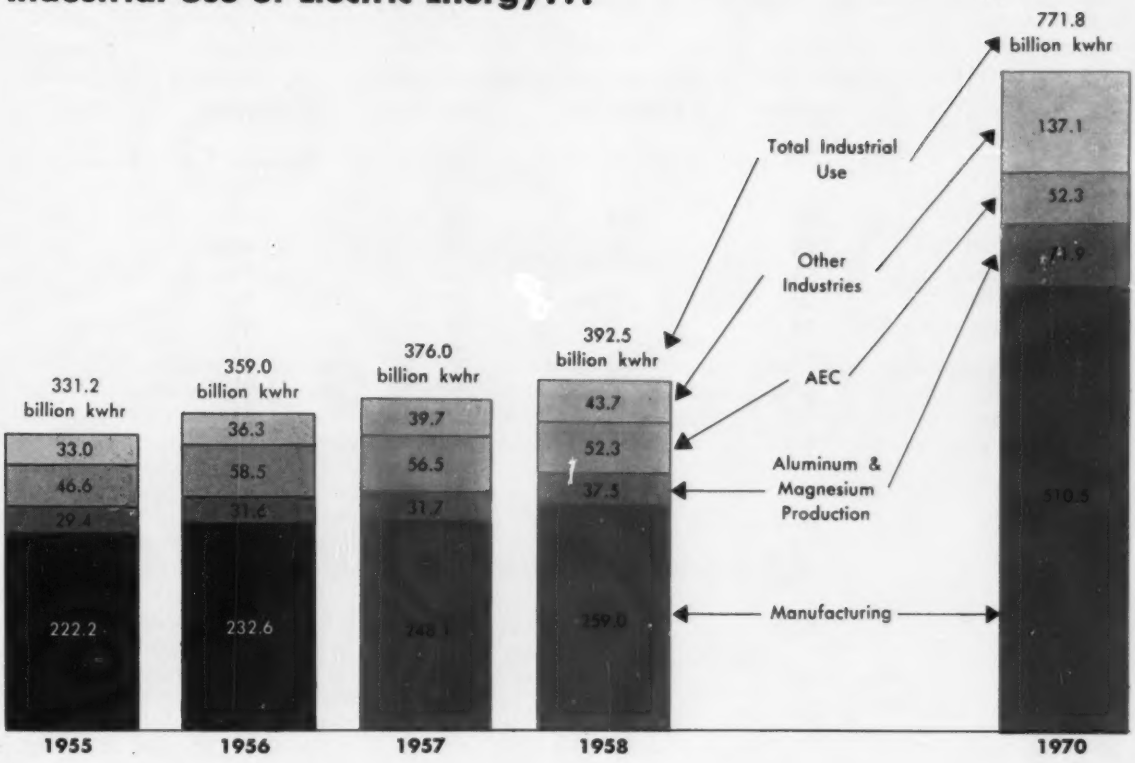


AEC Load Dips This Year

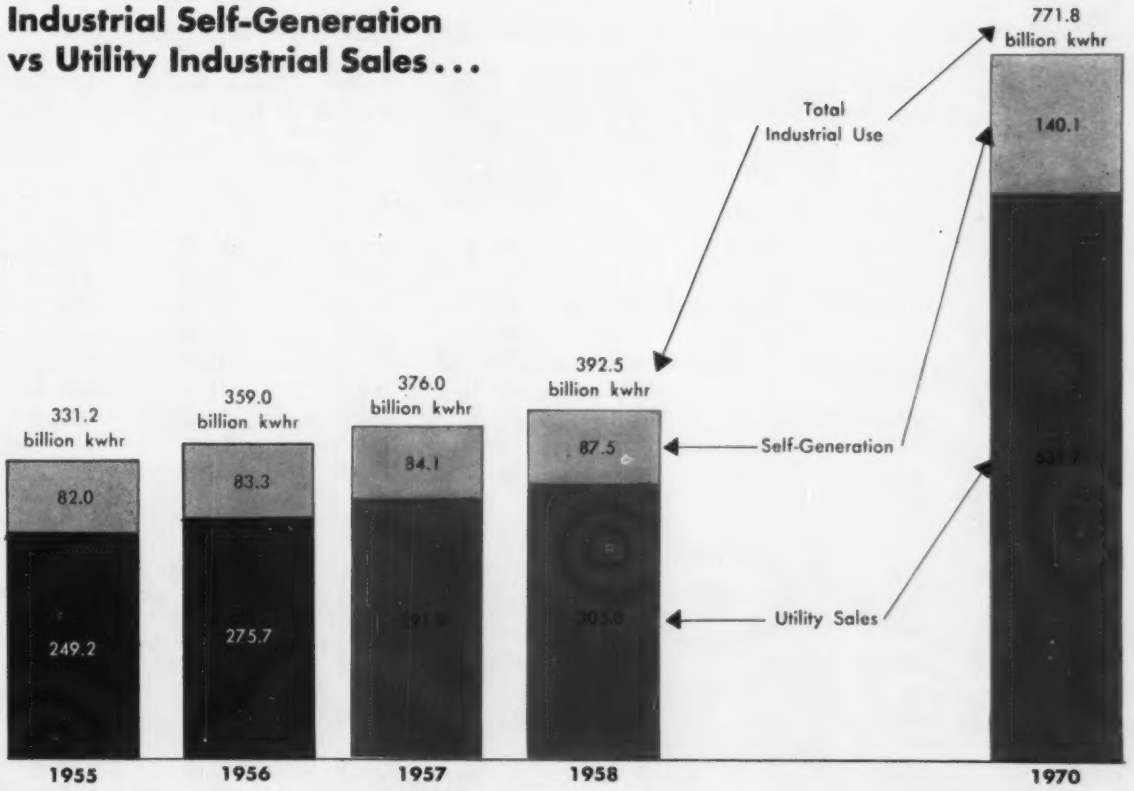
Another big user of electrical energy is the Atomic Energy Commission. The AEC load, which grew in giant steps since 1952, finally hit a peak of 58.5 billion kwhr in 1956, accounting for 9.8% of total energy produced. According to AEC officials, an ample stockpile of atomic raw materials and increases in production efficiencies will permit AEC installations to cut back on their power requirements. In 1957, AEC installations will consume 56.5 billion kwhr—a drop of 3.4% from last year. By 1958, AEC requirements will have dipped to 52.3 billion kwhr per year—a level which we expect will be maintained through 1970, barring any sudden tempera-

(*Continued on page* 101)

Industrial Use of Electric Energy...



Industrial Self-Generation vs Utility Industrial Sales...



Industrial Production Will Climb 60% by 1970 . . .

	Industrial Production	Manufacturing Production	Manufacturing Manhours	Primary Aluminum Production	Primary Magnesium Production
	1947–49 = 100	1947–49 = 100	billions	thousand tons	thousand tons
1948	104	103	26.51	623	10
1949	97	97	23.64	603	12
1950	112	113	25.94	719	16
1951	120	121	27.84	837	41
1952	124	125	27.82	937	106
1953	134	136	29.13	1,252	93
1954	125	127	25.99	1,461	70
1955	139	140	27.64	1,566	61
1956	143	144	27.72	1,679	68
			FORECAST		
1957	145	147	27.50	1,679	74
1958	148	150	27.50	1,990	86
1959	153	155	27.00	2,375	94
1960	161	163	26.50	2,550	110
1965	193	196	27.70	3,113	200
1970	232	236	28.70	3,663	300

. . . Boosting Industrial Power Sales by 116%

	Manufacturing Use	Aluminum and Magnesium	AEC Use	Other Industries	Total Industrial Use	Generation by Industrial Plants	Utility Industrial Sales
			billion kwhr				
1948	144.6	11.4	2.3	19.9	178.2	54.1	124.1
1949	139.7	11.1	2.2	21.7	174.7	54.0	120.8
1950	157.9	13.3	2.5	24.9	198.6	59.5	139.1
1951	174.8	15.8	3.7	26.2	220.5	62.7	157.8
1952	177.7	18.7	6.7	28.1	231.2	63.8	167.4
1953	195.3	24.3	12.5	29.4	261.5	71.5	190.0
1954	192.1	27.7	23.4	30.0	273.2	73.0	200.2
1955	222.2	29.4	46.6	33.0	331.2	82.0	249.2
1956	232.6	31.6	58.5	36.3	359.0	83.3	275.7
				FORECAST			
1957	248.1	31.7	56.5	39.7	376.0	84.1	291.9
1958	259.0	37.5	52.3	43.7	392.5	87.5	305.0
1959	272.0	44.6	52.3	48.1	417.0	91.0	326.0
1960	292.4	48.1	52.3	52.9	445.7	94.6	351.1
1965	387.2	60.0	52.3	85.1	584.6	115.1	469.5
1970	510.5	71.9	52.3	137.1	771.8	140.1	631.7

ture changes in the "cold war".

Adding electric energy use by other industries such, as mining, petroleum, and government manufacturing to that used by manufacturing and the AEC, we come up with 376 billion kwhr for total industrial use of electric energy in 1957. This 4.7% gain over 1956 will be followed by a further 4.4% gain in 1958.

By 1970, total industrial use of electric energy will hit 772 billion kwhr—115% more than last year.

Utility industrial sales, up 116% by 1970, will account for 81.8% of total industrial use of energy. The remainder will be supplied by industrial self-generation, which accounted for 23.2% of the total last year.

Suburbs Build Commercial Sales

The move to the suburbs by large segments of our population since World War II has provided a steady increase in commercial customers for electric utilities. This population shift caused merchants to follow along and forced them to increase their outlets to provide the ever-increasing amount of goods and services demanded by the new suburbanites.

The movement to the suburbs has only started. We can expect that as the new federal highway construction program begins to bear fruit, we will experience a new surge. The spreading out of traditional market areas will call for new office buildings, restaurants, and retail stores to serve this bigger and wealthier consumer market.

But as commercial customers increase, there will be more competition among merchants for the consumer dollar. With volume a necessity to bolster the retailers' dwindling return on investment, we can expect more modern store lighting, air conditioning, and electrical office equipment in stores and office buildings.

Average Use Up 7% In '57

Additional use of electric energy by commercial establishments will boost average annual use to 15,359 kwhr in 1957—almost 7% more than last year. Next year average use will jump to 16,388 kwhr per year. Between 1958 and 1970 average commercial use will increase 118% to 35,687 kwhr.

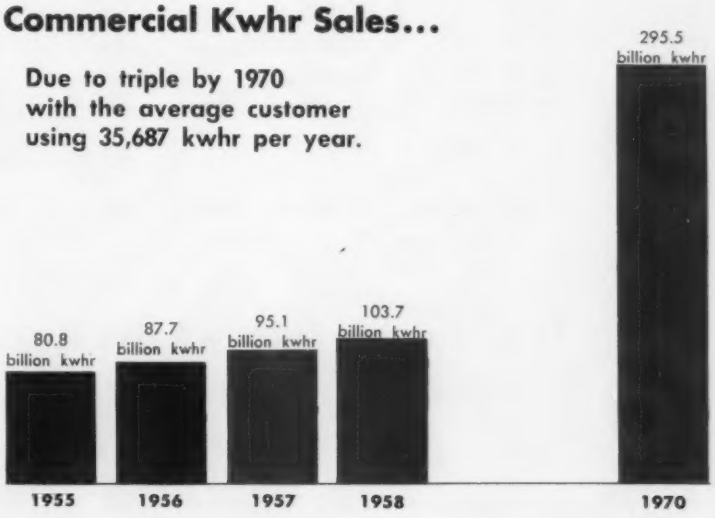
More customers and increased usage will boost total commercial sales from 87.7 billion kwhr in 1956 to 95.1 billion kwhr in 1957. A 9% gain in 1958 will push the total to almost 104 billion kwhr. From then until 1970 sales will increase 185% to 295.5 billion kwhr.

"Other" sales by utilities will continue rising. The biggest gains will come from rural customers and increased street and highway lighting spurred by the road-building program.

In 1957, "other" sales will increase 4.1% to 33.2 billion kwhr. By 1958 the annual gain will run about 4.5% or 1.5 billion kwhr. And by 1970, "other" sales will total 57.9 billion kwhr—74% more than this year.

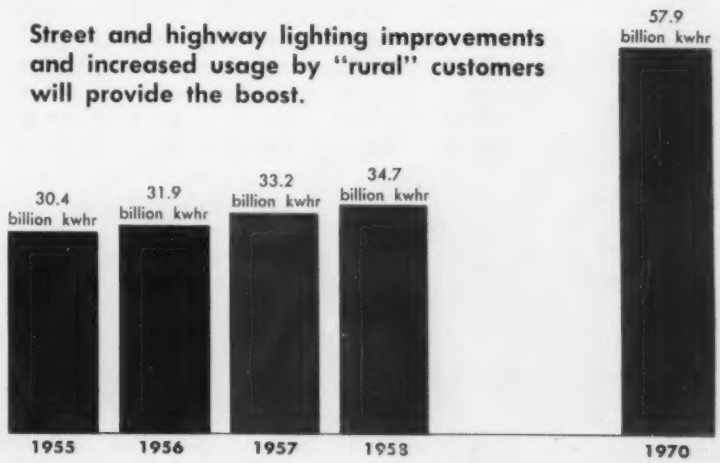
Commercial Kwhr Sales...

Due to triple by 1970 with the average customer using 35,687 kwhr per year.



"Other" Kwhr Sales...

Street and highway lighting improvements and increased usage by "rural" customers will provide the boost.



Commercial Sales Will Increase 185% in 12 years . . .

	Commercial Customers	Average Annual Use per Customer	Commercial Sales	Rural Sales	Street & Highway Lighting Sales	Other Public Authority Sales	Railway & Railroad Sales	Inter-departmental Sales
	thousand	kwhr	billion kwhr	billion kwhr	billion kwhr	billion kwhr	billion kwhr	billion kwhr
1948	**5,132**	**8,535**	**43.2**	**6.3**	**2.5**	**6.3**	**6.7**	**0.7**
1949	**5,291**	**8,871**	**46.3**	**7.4**	**2.7**	**6.6**	**6.1**	**0.6**
1950	**5,466**	**9,320**	**50.4**	**7.4**	**3.0**	**7.2**	**5.9**	**0.6**
1951	**5,528**	**10,432**	**57.3**	**8.5**	**3.3**	**8.0**	**5.8**	**0.5**
1952	**5,634**	**11,106**	**62.1**	**8.5**	**3.5**	**8.4**	**5.4**	**0.5**
1953	**5,863**	**12,007**	**69.2**	**9.6**	**3.8**	**9.0**	**5.0**	**0.6**
1954	**5,992**	**12,353**	**73.4**	**10.2**	**4.0**	**9.4**	**4.7**	**0.6**
1955	**6,042**	**13,422**	**80.8**	**10.8**	**4.4**	**10.2**	**4.6**	**0.6**
1956	**6,125**	**14,395**	**87.7**	**11.1**	**4.7**	**11.0**	**4.4**	**0.6**
			FORECAST					
1957	6,254	15,359	95.1	11.6	5.1	11.5	4.4	0.6
1958	6,396	16,388	103.7	12.1	5.6	12.1	4.4	0.6
1959	6,539	17,486	113.2	12.6	6.0	12.8	4.4	0.6
1960	6,667	18,658	123.4	13.1	6.6	13.6	4.4	0.6
1965	7,480	25,804	191.3	15.8	10.0	16.5	4.4	0.6
1970	8,344	35,687	295.5	18.6	15.1	19.2	4.4	0.6

. . . As Total Electric Energy Sales Reach 1.5 Trillion Kwhr

	Residential		Industrial		Commercial		"Other"		Total
	billion kwhr								
	Sales	(% total)	Sales	(% total)	Sales	(% total)	Sales	(% total)	Sales
1948	**51.0**	**21.2**	**124.1**	**51.6**	**43.2**	**17.9**	**22.5**	**9.3**	**240.7**
1949	**58.1**	**23.4**	**120.8**	**48.6**	**46.3**	**18.6**	**23.4**	**9.4**	**248.5**
1950	**67.0**	**23.9**	**139.1**	**49.5**	**50.4**	**18.0**	**24.0**	**8.6**	**280.5**
1951	**77.0**	**24.2**	**157.8**	**49.6**	**57.3**	**18.0**	**26.0**	**8.2**	**318.2**
1952	**86.8**	**25.3**	**167.4**	**48.9**	**62.1**	**18.1**	**26.3**	**7.7**	**342.5**
1953	**97.0**	**25.2**	**190.0**	**49.5**	**69.2**	**18.0**	**28.0**	**7.3**	**384.2**
1954	**108.5**	**26.4**	**200.2**	**48.7**	**73.4**	**17.9**	**28.9**	**7.0**	**410.9**
1955	**120.5**	**25.1**	**249.2**	**51.8**	**80.8**	**16.8**	**30.4**	**6.3**	**480.9**
1956	**133.9**	**25.3**	**275.7**	**52.1**	**87.7**	**16.6**	**31.9**	**6.0**	**529.2**
				FORECAST					
1957	147.4	26.0	291.9	51.4	95.1	16.8	33.2	5.8	567.6
1958	163.6	27.0	305.0	50.2	103.7	17.1	34.7	5.7	607.0
1959	181.5	27.6	326.0	49.6	113.2	17.2	36.4	5.5	657.1
1960	200.8	28.1	351.1	48.2	123.4	17.3	38.3	5.4	713.6
1965	322.0	31.3	469.5	45.6	191.3	18.6	47.3	4.6	1,030.1
1970	500.9	33.7	631.7	42.5	295.5	19.9	57.9	3.9	1,486.0

1957 Sales To Be 7.3% Above '56...

Industry-wide sales of electric energy will add up to almost 568 billion kwhr in 1957 for a gain of 7.3% over the 529 billion kwhr consumed in 1956. By the end of 1958, energy sales will climb another 39 billion kwhr (6.9%) to a level of 607 billion kwhr per year.

By 1970, the nation's electric utilities will realize total annual sales of almost 1.5 trillion kwhr—181% more than was sold last year.

The share of each category's contribution to the total sales picture will continue to change as it has over the past decade. Residential's share of the total has increased from 21.2% in 1948 to 25.3% in 1956. By 1970, residential sales will account for 34% of the total.

Industry Share Is Smaller

Industrial sales, which bounced back to 52% of the total last year after dropping to 48.7% in 1954, will slowly drop down to 42.5% of total energy sales by 1970.

Delivering 567.6 billion kwhr to ultimate customers in 1957 will require the nation's major electric utility systems (Class I) to produce almost 644 billion kwhr or 7.8% more than the 597 billion kwhr turned out in 1956. Next year's sales will require another 7% increase, boosting total annual production to slightly more than 689 billion kwhr—more than double the 329 billion kwhr produced in 1950.

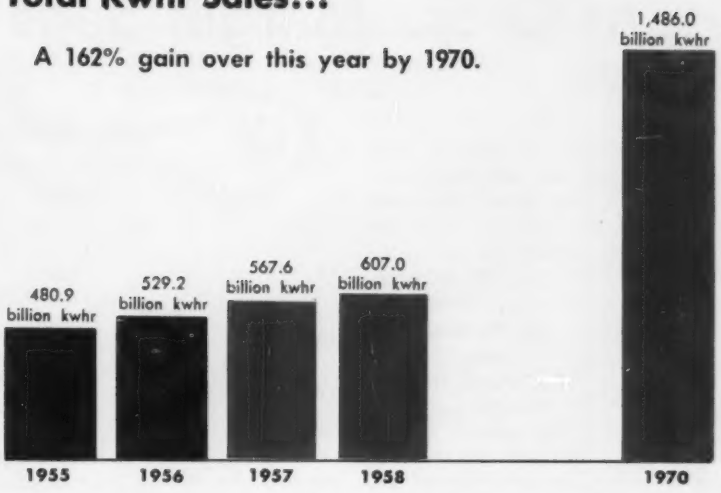
In 1970, our electric energy needs will require utilities to generate 1.7 trillion kwhr, or 164% more than the 644 billion kwhr in the cards for 1957.

December peak loads on Class I systems will hit 113.9 million kw in 1957—11% over last year. Next year's peak is estimated at 121.8 million kw, an increase of 6.9%. Both years will be dwarfed by the 1970 peak load which will increase 159% over 1957 to 295 million kw.

At first glance an 11% increase

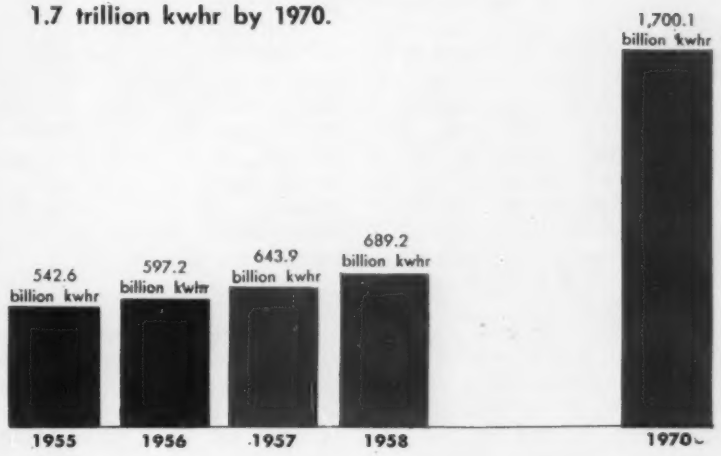
Total Kwhr Sales...

A 162% gain over this year by 1970.



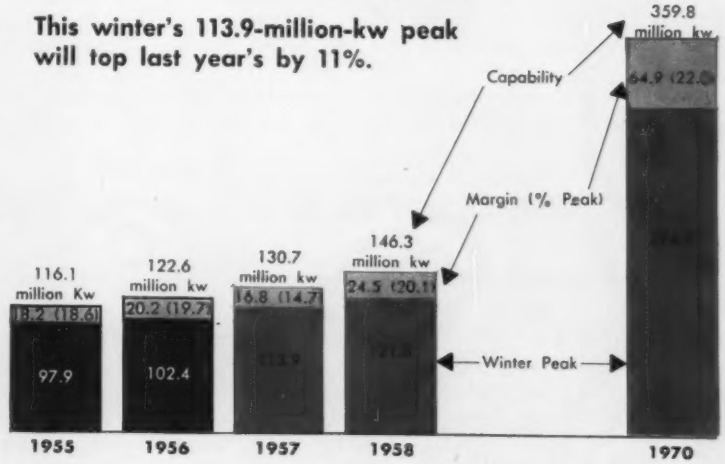
Electric Energy Output...

1.7 trillion kwhr by 1970.



Peak Loads and Capability...

This winter's 113.9-million-kw peak will top last year's by 11%.



. . . as Gross Margin Sags to 14.7%

in this year's peak load may appear a bit optimistic. Actually, it isn't if you consider that last year's peak was considerably lower than had been expected due to extremely mild weather during the period the peak normally occurs. When measured against the actual winter peak which hit in January, the increase is only about 8.7%. Bolstering this prediction is our economic forecast for an upturn in industrial production during the last quarter.

Summer peak loads are continuing upward. The net effect of this increase was illustrated this past July when three large utilities were forced to curtail service under the impact of two three-day heat storms. Disappearance of the traditional summer valley, and the appearance of summer peaks has compounded the problems of scheduling machine outages for normal maintenance. With winter peaks also climbing, there remains only a few short weeks in spring and fall for routine inspection and repair. It appears that this double threat will force utilities to maintain gross margins as close to 22% as possible.

The amount of generating capacity to be added in the near future is pretty much set at this time and has little to do with our load forecasts for '57 and '58.

In 1957, capacity additions will bounce up to 8.5 million kw after hitting a low of 6.3 million last year. Next year capacity additions will zoom to a record 16.4 million kw. By 1970, even this record will be surpassed by the addition of 26.8 million kw.

As in the past, conventional fuel burning plants will account for the greater part of new capacity additions. This year over 7.1 million kw of steam plants will be added as against 1.3 million kw of hydro. The remainder, or 73-Mw, will be accounted for by the operation of this country's first atomic power plant at Shippingport, Pa.

Capacity Additions—Thousands of Kw

	Conventional Steam	Nuclear	Hydro	Total
1957	7,126	73	1,301	8,500
1958	13,666	0	2,746	16,412
1959	13,876	190	1,122	15,188
1960	13,529	635	1,100	15,264
1965	16,733	1,000	1,100	18,833
1970	23,308	2,400	1,100	26,808

Retirement of older generating units will hold down net additions to generating capability. In 1957, utilities will retire almost 400 Mw of older generating units. Increased operating costs will force utilities to retire more and more capacity each year. By 1970, annual retirements should reach a level of 2 million kw a year.

Capability Climbs 6.6%

Subtracting retirements from new capacity still results in substantial increases to net generating capability. This year the nation's power systems will boost capability to 130.7 million kw for a 6.6% increase over last year's 122.6 million kw. The record year 1958 will push capability up 11.9% to 146.3 million kw.

December gross margin will dip to 14.7% this year despite a 6.6% increase in capability. But next year's capacity additions will push this back up to 20.1%—a much more comfortable position considering those summer peaks.

Generation expenditures will increase more than 17% in 1958 to pay for 16.4 million kw of new capacity. While part of this has already been payed for out of '57 appropriations, about $2.5 billion will be required to put this capacity "on-the-line" and lay the groundwork for additions in 1959 and '60.

New additions in 1970, at today's costs, will require the expenditure of almost $4.4 billion.

Transmission budgets will reflect capability increases. Next year, transmission expenditures will rise to $821 million for an increase of 13% over this year's budget of $728 million. By 1970, transmission spending will run almost $1.8 billion—149% more than 1957.

Distribution expenditures will hit $1.8 billion in 1958—chalking up an 8.5% increase over this year. In 1970, distribution facilities will require the expenditure of $4.6 billion annually—almost as much as the industry's total capital expenditures for 1957.

Total utility expenditures in 1958 will add up to $5.3 billion—13.2% higher than '57's total of $4.6 billion. In 1970, total utility spending will be almost $11.5 billion.

COMPARISON OF EEI AND ELECTRICAL WORLD FORECASTS

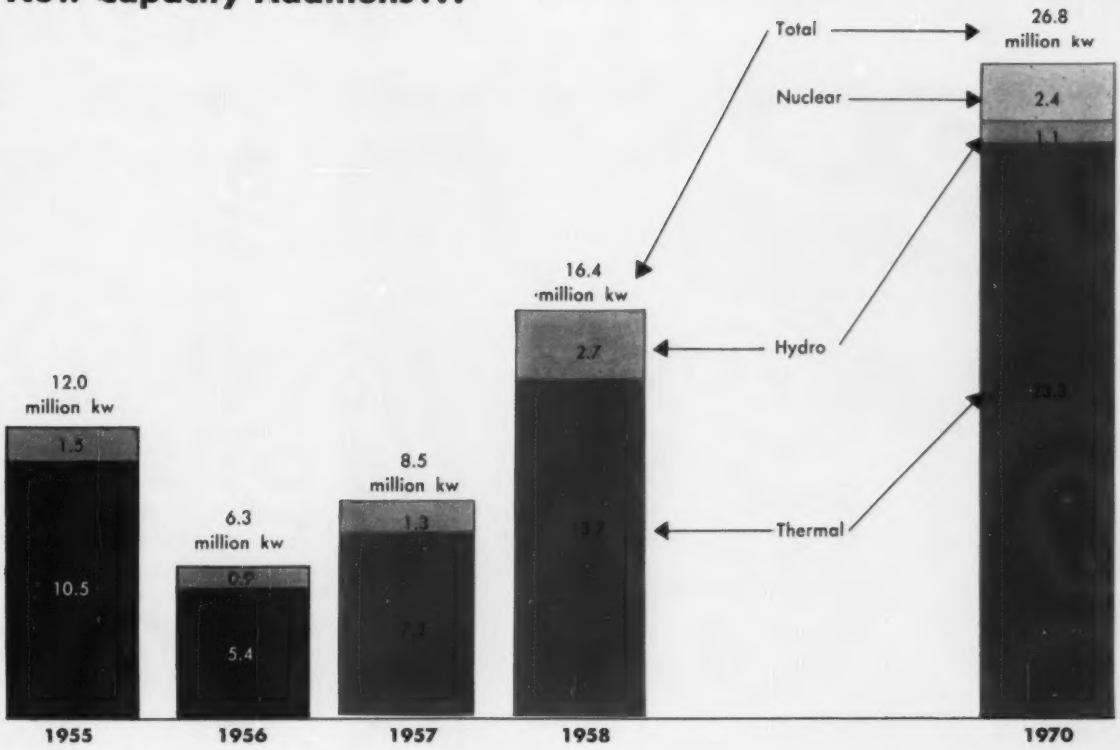
Electric Energy Output—Billions Kwhr

	EEI	Electrical World
1956	597.2	
1957	646.9 up 8.3%	643.9 up 7.8%
1958	703.5 up 8.7%	689.9 up 7.0%
1959	757.3 up 7.6%	746.8 up 8.4%
1960	811.1 up 7.1%	811.8 up 8.7%

December Peak Loads—Millions of Kw

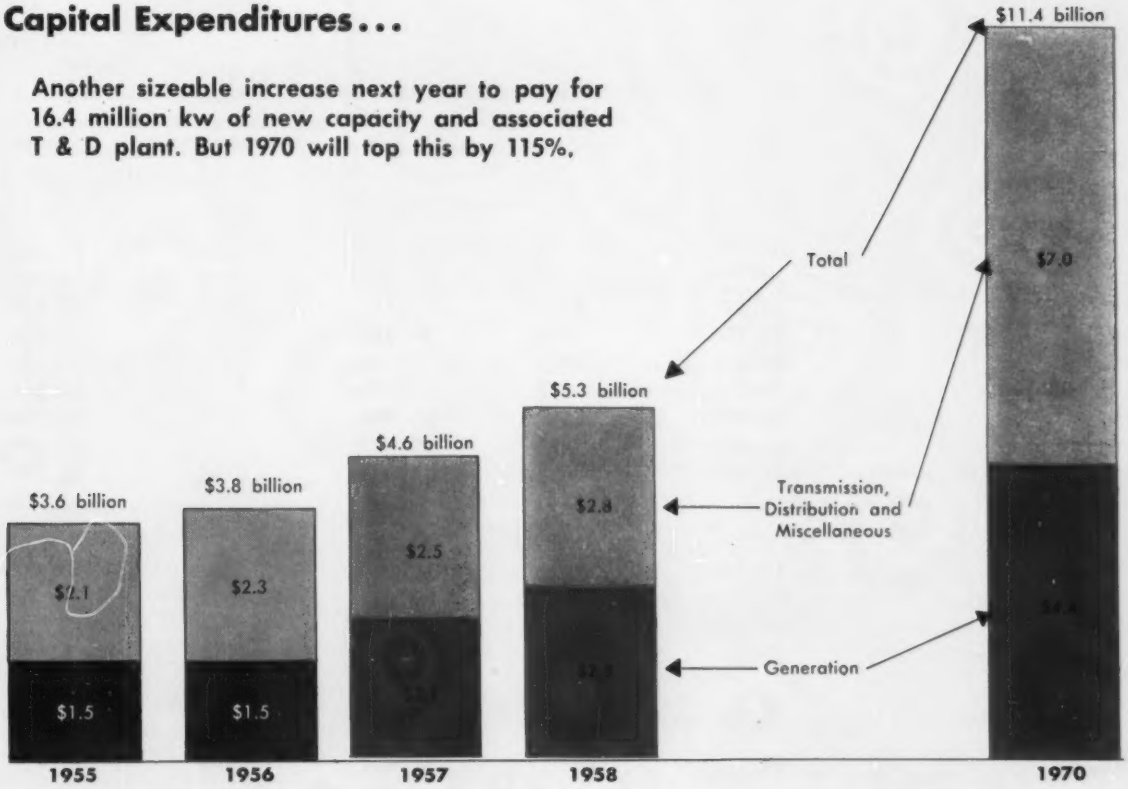
	EEI	Electrical World
1956	102.4	
1957	113.4 up 10.7%	113.9 up 11.2%
1958	123.1 up 8.6%	121.8 up 6.9%
1959	132.2 up 7.4%	131.9 up 8.3%
1960	141.5 up 7.0%	143.3 up 8.6%

New Capacity Additions...



Capital Expenditures...

Another sizeable increase next year to pay for 16.4 million kw of new capacity and associated T & D plant. But 1970 will top this by 115%.



Capability to Jump 15.6 Million Kw in 1958 . . .

	Output	Winter Non-Coincident Peak Load	Load Factor	Capability	Gross Margin
	billion kwhr	million kw	%	million kw	% Peak
1948	**277.0**	**51.1**	**61.9**	**54.4**	**6.6**
1949	**287.7**	**54.0**	**60.8**	**61.7**	**14.2**
1950	**328.6**	**62.0**	**60.9**	**68.4**	**10.3**
1951	**370.8**	**68.1**	**62.1**	**76.2**	**11.8**
1952	**398.3**	**72.8**	**62.2**	**81.5**	**11.9**
1953	**441.2**	**78.4**	**64.2**	**92.4**	**17.8**
1954	**471.9**	**85.7**	**62.8**	**103.7**	**21.0**
1955	**542.6**	**97.9**	**62.1**	**116.1**	**18.6**
1956	**597.2**	**102.4**	**65.1**	**122.6**	**19.7**
		FORECAST			
1957	643.9	113.9	64.5	130.7	14.7
1958	689.2	121.8	64.6	146.3	20.1
1959	746.8	131.9	64.6	160.5	21.7
1960	811.8	143.3	64.7	174.8	22.0
1965	1,175.8	206.0	65.2	251.3	22.0
1970	1,700.1	294.9	65.8	359.8	22.0

Data in this table is for Class 1 Systems. These operate about 97% of the nation's generating capacity. All other data (kwhr sales, capital spending etc.) is industry-wide.

. . . Sending Construction Expenditures to $5.3 Billion

	Generation	Transmission	Distribution	Miscellaneous	Total
			million dollars		
1948	**$1,103**	**$400**	**$1,075**	**$84**	**$2,662**
1949	**$1,410**	**$400**	**$1,190**	**$93**	**$3,093**
1950	**$1,275**	**$425**	**$1,127**	**$109**	**$2,936**
1951	**$1,344**	**$504**	**$1,089**	**$131**	**$3,068**
1952	**$1,925**	**$577**	**$1,118**	**$118**	**$3,738**
1953	**$2,088**	**$647**	**$1,200**	**$127**	**$4,062**
1954	**$1,939**	**$666**	**$1,288**	**$122**	**$4,015**
1955	**$1,547**	**$571**	**$1,343**	**$161**	**$3,622**
1956	**$1,479**	**$598**	**$1,518**	**$186**	**$3,781**
			FORECAST		
1957	$2,096	$728	$1,617	$207	$4,648
1958	$2,460	$821	$1,754	$225	$5,260
1959	$2,325	$833	$1,903	$244	$5,305
1960	$2,185	$846	$2,065	$264	$5,360
1965	$3,233	$1,259	$3,083	$397	$7,972
1970	$4,393	$1,811	$4,634	$598	$11,436

A General Electric
Voltage Regulator Engineer Asks . . .

WHY UNTANK IT AT ALL?

By D. D. MacCarthy

Manager—Engineering
Voltage Regulator Product Section
General Electric Company

One very important point has been left out of recent discussions on "ease of regulator untanking":

On the average, the General Electric ML-32 step voltage regulator doesn't have to be untanked at all until after 20 to 25 years of service.

This point, I think, is important because it tends to put this "ease of untanking" feature in its proper perspective.

Whereas we design the ML-32 to be reasonably easy to untank, this is not our primary interest. We believe that a regulator should be on the line "open for business" rather than off the line "open for repairs."

Here are six of the many *exclusive* G-E features we build into the ML-32 to make untanking a seldom-needed thing:

1. *Tap Leads* are brought directly to the tap switch, thus eliminating about 20 connections in the power circuit.

2. *Internal Thyrite* by-pass resistor* is closely coordinated with series winding insulation for maximum protection. Since it is an *internal* by-pass it is not subject to external damage.

3. *Switch insulation strike and creep distances* are more conservative than other regulators. Moreover . . .

4. *Electrostatic shielding* prevents excessive carbon accumulation at critical points on insulating panels. This means long insulation life, even in carbonized oil.

5. *Optimum-life switching,* with speed controlled by impeller, gives extra-long switch life. Arconite switch contacts are of ample size for long life.

G.E.'s ML-32 is designed for 20 to 25 years of dependable, on-the-line service.

6. *Spring-driven Geneva-gear switch drive* has the simplest construction of any regulator. This means fewer parts to cause trouble.

As a further testimonial to the ML-32's mechanical and electrical strength, G.E. is, to my knowledge, the only manufacturer who guarantees a successful tap change under short circuits—including a guarantee of withstanding short-circuit forces at all load-bonus positions.

So, although I agree it's a good thing to take a regulator apart every couple of decades, I still ask: "Until then, why untank it at all?"

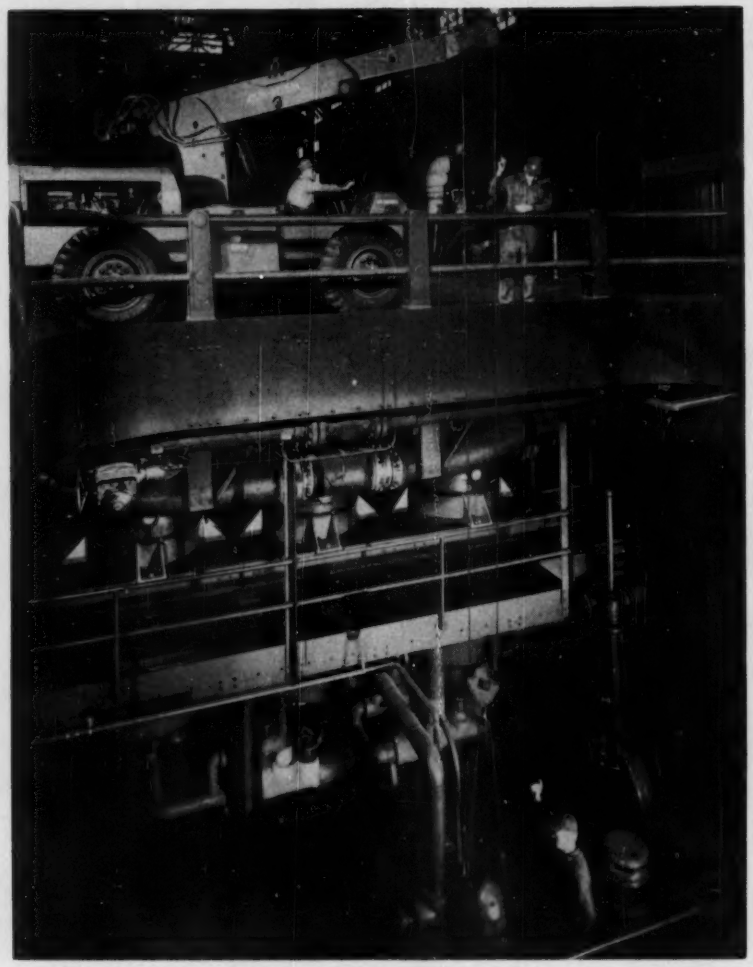
For more information, write Section 423-20, General Electric Co., Schenectady 5, N.Y., or contact your General Electric sales office or agent.

*Reg. Trade-mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

Hydraulic Crane Speeds Plant Maintenance



HYDRAULIC CRANE is self-propelled, compact, and capable of turning in a small area. Consequently, it can move about in the plant and mount plant's ramps

GENERATION—Maintenance

A self-propelled hydraulic crane has achieved appreciable labor savings on maintenance jobs at Duquesne Light Co's Brunot Island power station at Pittsburgh, Pa. From 6 to 20 hr have been cut from the time for some jobs, and plant-wide problems in materials handling and maintenance have been simplified.

The new crane has a capacity of 5 tons at a 10-ft radius. It has a telescoping boom that can be extended or retracted to provide boom lengths; revolves through a full circle; tilts from horizontal to an elevation of 66 deg, and has hydraulic controls for all movements of the boom.

Complementing the boom is the crane's self-propelled chassis, featuring front and rear-end steer, torque-converter drive, four-wheel drive, power steering, and full hydraulic control.

Purchased primarily to supplement the large overhead crane serving the powerhouse, it has become a puller, tugger, lifter, carrier, positioner, digger, and jack-of-all-trades. Formerly the overhead crane handled all lifts during a major overhaul of powerhouse equipment. Disassembly, assembly, and some intervening work on components had to be scheduled according to the number and sequence of lifts in a day. Often jobs stood idle while the big crane was lifting for others. Frequently the 20-ton crane was used inefficiently to lift parts too light to warrant its use. Now the new crane handles the smaller lifts, carries parts to repair locations, and positions them for reassembly.

Teams With Big Crane

Often the two cranes team up. For example, the large one lifts the main cover of a turbine and holds it while the smaller one moves in to lift out the bearing blocks and other smaller parts. Such teamwork halves crane time on major overhauls, and the small self-propelled crane itself has cut total time by about 25%.

Besides supplementing the overhead crane, the new machine does a variety of jobs. It saves dozens of manhours monthly in handling chlorine tanks, and it positions and turns large water screens weighing up to 3 tons each when the screens are sand-blasted and repainted. It handles scrap metal.

In handling incoming chlorine tanks, the new crane has saved up to 46 manhours per carload. Before its purchase, unloading a railroad car containing 15 chlorine tanks and placing the tanks in storage took six men working 8 hr, a total of 48 manhours per car. Now the tanks are handled by a three-man crew in just 2 hr.

Water screens must be removed periodically from the water screening house, taken outside, cleaned, sand-blasted, and repainted. Lifts for handling these screens were formerly made by the overhead crane, which placed them on a dolly. The dolly was pushed outside for the work on the screens, pushed back

(*continued on page* 112)

The nut that's built to strip

A capacitor with a stripped terminal stud or a broken bushing is useless for service and a tough job to repair. That's why we protect General Electric capacitors against the major cause of such damage.

The lineman who forgets his own strength or uses too big a wrench isn't likely to strip a stud or break a bushing on a General Electric capacitor. If excess torque is applied, the softer brass terminal nut is designed to strip first, before real damage is done. All our heavy-handed friend has to do is replace the nut.

Making a strong point out of weakness is another way in which General Electric designers have added to the Engineered Extras that distinguish G-E capacitors.

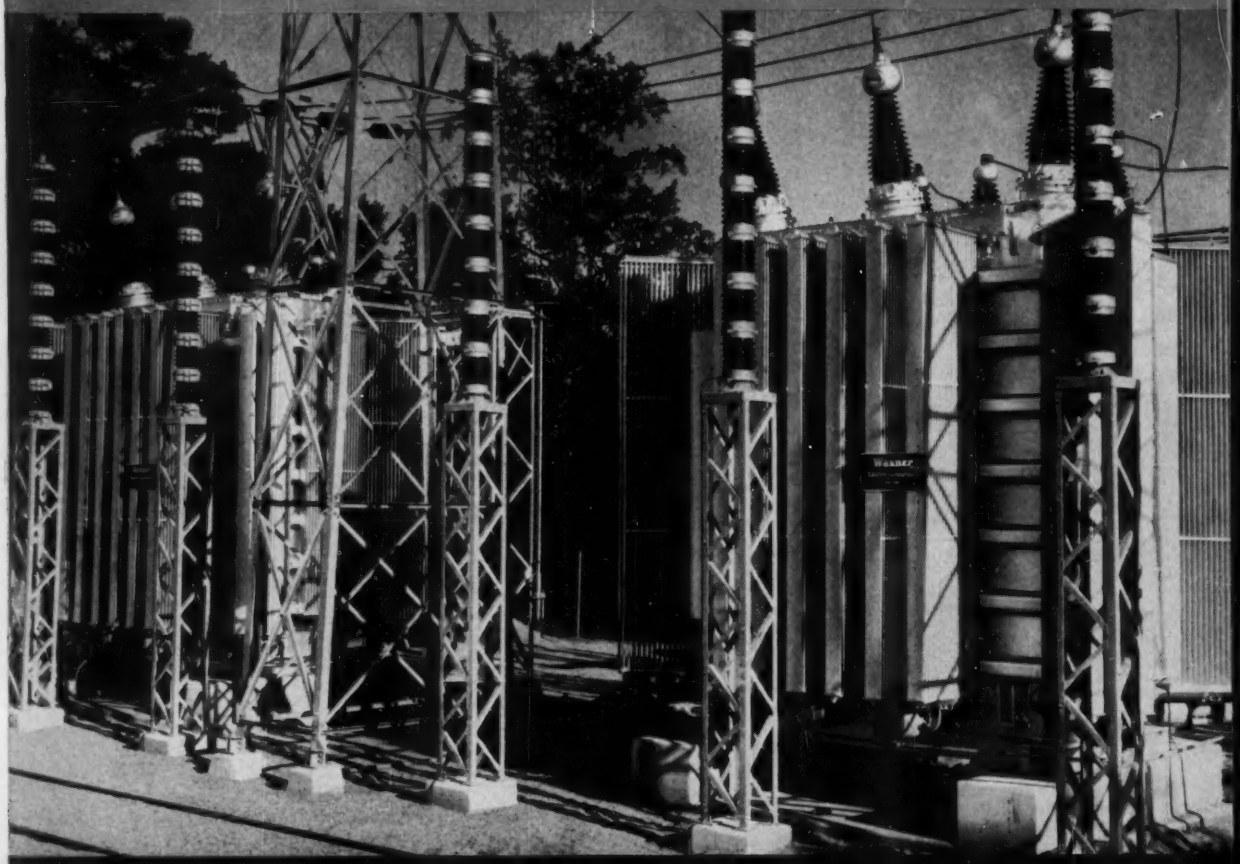
Want more facts? Your G-E Apparatus Sales Engineer has most of them at his fingertips. Or write to General Electric, Section 445-2, Schenectady 5, New York.

Progress Is Our Most Important Product

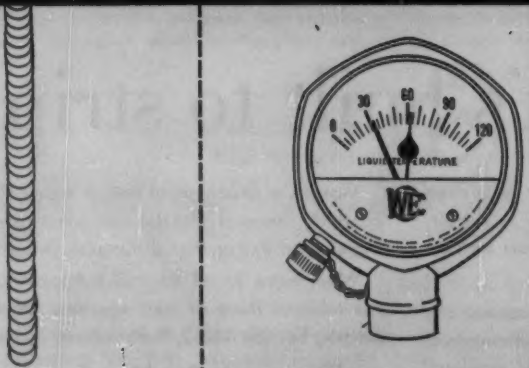
GENERAL ELECTRIC

Quality is what you get

WAGNER POWER

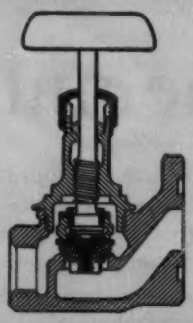


THESE SIX SMALL DETAILS ADD UP TO BETTER



DEEP, PENETRATING WELDS. Submerged electro-arc melt welds penetrate deeply, are exceptionally smooth and uniform. Inspectors say, "the best welds made anywhere."

LIQUID ACTUATED THERMOMETERS. Much more accurate and dependable than thermometers that are actuated by a coiled bi-metal strip.



DRAIN VALVES THAT DRAIN *ALL* THE OIL. This 2" bolted-on drain valve, with auxiliary oil sampling valve, will drain the tank completely. Used on ASA standard rated transformers.

when you specify TRANSFORMERS

The extreme care given each Wagner Power Transformer—from inception to installation—is in keeping with Wagner's one objective . . . to build the best possible transformer that will give you years of completely dependable service.

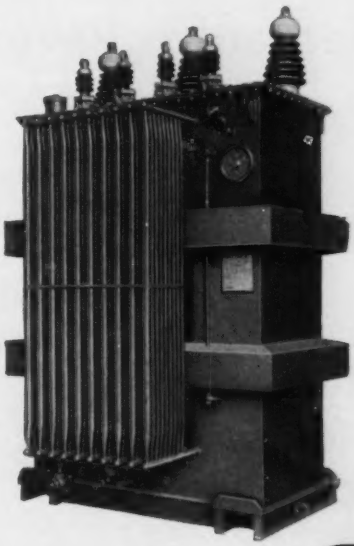
Here are a few of the big reasons why you gain when you specify Wagner:

POWER TRANSFORMER WINDINGS, in general, are disk type for the high voltage windings and helical type for the low voltage windings—best suited to obtain rigid bracing and provide low temperature gradients throughout.

LEADS AND TAP CONNECTIONS are effectively supported for safe electrical clearance and mechanical rigidity by means of firmly positioned bakelite tubes or strong clamps on the supporting members.

TANKS are designed for strength to withstand operating pressures, with braces of heavy fabricated structural steel on the sides and ends spaced to eliminate low frequency audio noises. All seam welds are made by a fully automatic welder.

Get the whole story . . . write for Bulletin TU-16D or better yet, ask your nearby Wagner branch to show you Wagner's sound-color movie: "Transformers in the Making."



LIVE BETTER ELECTRICALLY

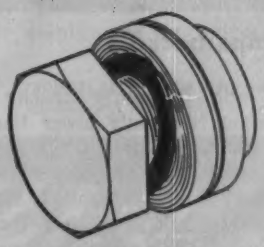
Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 14, MISSOURI

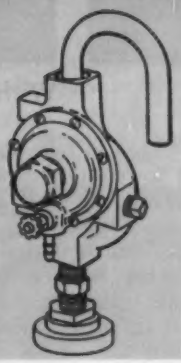
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

T57-15

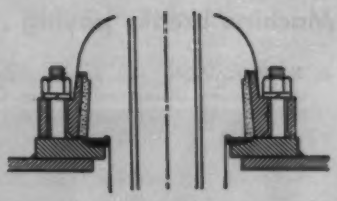
PERFORMANCE — EASIER MAINTENANCE



LEAK-PROOF MOUNTING BOSS. For thermometer wells, relay wells and radiator drain plugs. Serrated surfaces make annular grooves in the annealed copper gasket to form leak-proof joint.



VACUUM-PRESSURE BLEEDER VALVE. Has large diameter diaphragms to actuate the valve mechanism when pressure or vacuum inside tank becomes too great. Located on the outside of sealed units for your convenience.



LEAK-PROOF BUSHING JOINT. The gasket is compressed between the porcelain shoulder of the bushing and the tank mounting flange—easy to tighten, simple to replace. Used on transformers with voltages 15 KV and below.

Speeds Maintenance

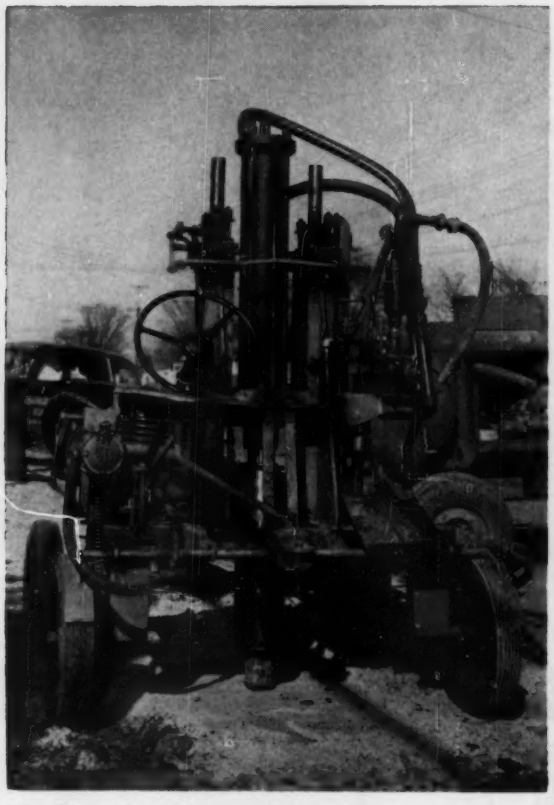
(*Continued from page* 108)

inside for lifting, turning, or positioning the screens, and then pushed outside again for further work on the screens. Now lifting, turning, and positioning are done by the smaller crane, and the dolly is eliminated along with the pushing crew.

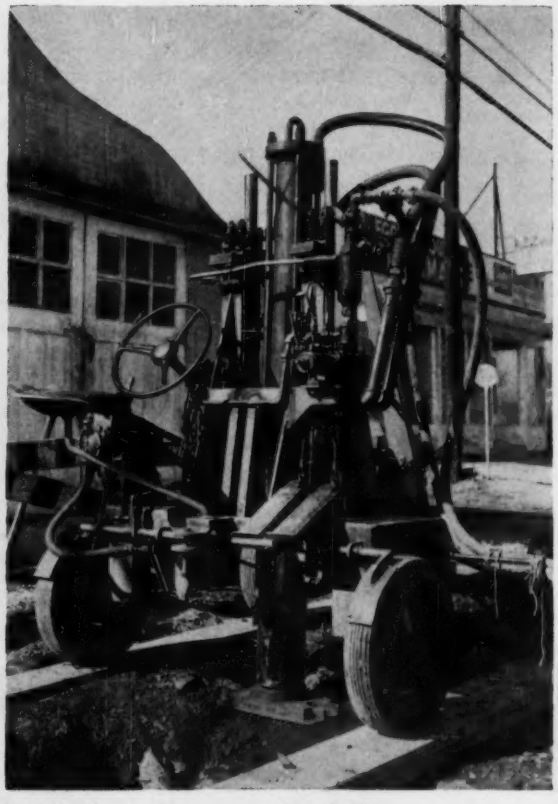
Loosening the studs from turbines and generators took 40 to 50 men, who engaged in a tug-of-war with a rope attached to the handle of a large open-end wrench. Now the crane lifts the 400-lb, 8-ft-long wrench into position, a steel cable is looped around the wrench handle, and the other end is hooked to the eye-bolts on the crane's front. Employing its precise torque-converter drive, the crane backs slowly until the stud is loose.

DISTRIBUTION—Construction

Mechanize Pavement Breaking Operations



Machine breaks paving . . .



With Shoe, it tamps backfill

R. K. WOODSON, Asst Superintendent, Underground Department, Kansas City Power & Light Co, Kansas City, Mo.

Machine methods eliminate practically all hand labor in the underground division of Kansas City Power & Light Co. The pneumatic paving breaker, which replaced the bull point and the sledge hammer, has in turn been replaced by two new power tools.

Both tools break by the impact or pile driver method. One uses an air piston to raise the ram and drive it down into the paving. This machine requires an air compressor of 210-cu-ft capacity for proper operation. The compressor must be towed from one job to another. When in operation this machine breaks 1 sq yd of paving in 0.067 manhours.

The other machine uses a hydraulic cylinder to raise the ram which then drops to contact the paving. It is self-propelled and can go from job to job at a speed of 25 mph. Its hourly capacity in operation is slightly lower than that of the pneumatically operated machine, but its mobility more than offsets this disadvantage. It costs less than half as much as the pneumatic machine with its air compressor.

The piston of either machine can be fitted with a shoe for tamping backfill. With the shoe, reasonably good soil can be compacted to a

(*Continued on page* 114)

Even in GREEK ... it's all very clear

A - Absolutely
B - BEST BY TEST
Γ - Globar's NEW
Δ - DELTA elements

... more durable ... more dependable

NOW IT CAN BE TOLD

After two years and hundreds of customer field tests ... Globar's new DELTA Silicon Carbide Heating Elements are unbeatable from *every* consideration. Shortly after Globar engineers perfected the Delta Elements, they were released to the field in restricted quantities and sizes to assure *performance* before public announcement.

Customer reaction speaks for itself:

- Delta Elements outperform *any* competitive element.
- Delta Element operation is more economical ... uniform resistance means fewer tap changes ... longer life ... lower operating costs.
- Delta Element terminals do not overheat, provide trouble-free connections. Elements can be installed in hot furnaces ... minimizes downtime.
- Delta Element resistance characteristic ... low at room temperature ... allows easy periodic operation.
- Delta Elements are available in a wide range of sizes to meet every application requirement ... regular sizes normally available from stock or within two weeks of order. Superior in *performance* and superior in *availability*

TECHNICAL SERVICE AND LITERATURE. *Globar's exclusive service ... a field staff of Electrical Engineers backed by 30 years experience is ready to assist you—without obligation. Technical Bulletin "H" is available upon request. Write Dept. EW 87-715.*

87-715 R

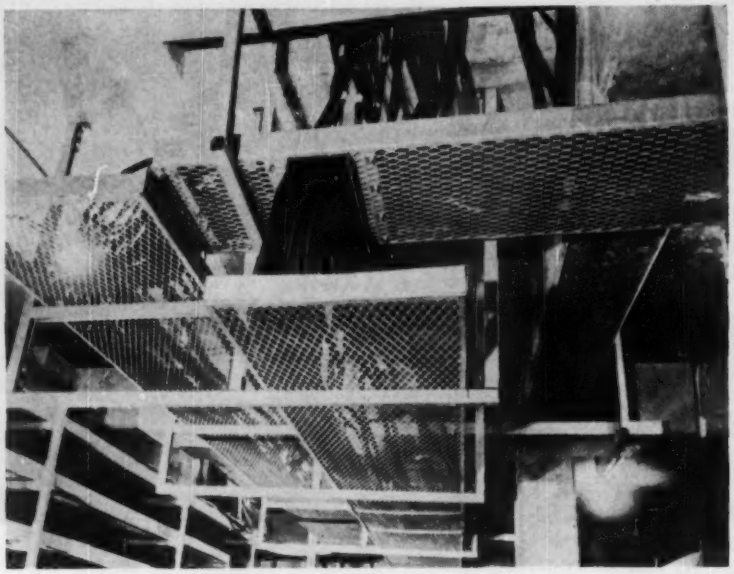
Globar®

DELTA ELECTRIC HEATING ELEMENTS

GLOBAR Division of THE CARBORUNDUM COMPANY, Niagara Falls, New York

SUPPORTS FOR CABLE AND TUBING PASS "THE ACID TEST"—

THE APPROVAL OF DESIGNERS, CUSTOMERS, AND USERS WHO SAY: "Well laid out and engineered." "Nicer and sturdier." "Quick and easy to install." "Boy, does that ladder look good!" "We're ordering more." "For my money, I'll take P-W Supports anytime." "Thanks, for good delivery."



P-W offers the latest in support systems—expanded metal, ladder, or solid—which are interchangeable as required. Comes in 3", 6", 9", 12", 18", and 24" widths, in 1' multiples from 1' to 10', 12' and 16' lengths. Can be purchased in two ways: (1) in certain standard lengths, or (2) in various lengths, which, together with P-W's Extension Connectors, eliminate all field cutting. Adjustable Horizontal and Riser Connectors give the greatest flexibility and meet all changes in direction and elevation. P-W's Channel Connectors, with drive rivets, provide not only a quick connection but good electrical continuity.

Our pre-cut system provides the greatest savings in material and installation time—waste is eliminated and the various parts assembled without field cutting. Send us your drawings and we will take off bill of material. When order is placed, we mark up drawings or reproducibles with catalog numbers. Same numbers are placed on items at time of shipment to facilitate field erection. P-W Twist-Rack is available to support trough or ladder.

Join our ever-growing list of outstanding and satisfied customers. The first step is to write today for our catalogs. Let our engineers help you!

P-W INDUSTRIES, INC. Duncan & Melrose Sts., Philadelphia 24, Pa.

Representatives throughout country to serve you!

Breaking Mechanized

(*Continued from page* 112)

depth of 4 ft. When this tamper is used with a mobile scoop for backfilling, time reductions have been considerable.

For example, if 1 manhour is required to place dirt in a ditch and tamp it by hand, ¾ manhour is required when the dirt is placed by hand and tamped with an air tamper. Only 0.128 manhour or 7½ manminutes is required to backfill and tamp with a combination scoop tamper team. Only two men are needed to backfill a ditch completely. One operates the scoop to transport and place the dirt; the other runs the self-propelled tamper.

DISTRIBUTION—Planning

Scale Model Speeds Job Instruction

CURTIS C. WING, Western Massachusetts Electric Co, Springfield, Mass.

Accurately scaled detailed models of pole-top construction speed the instruction of field men in construction changes on Western Massachusetts Electric Co's distribution lines. Currently, some 4-kv lines are being changed over to carry 13 kv.

The instruction of these men by means of drawings and blue prints was not always entirely satisfactory. Nor was it always practicable to take them to a demonstration pole for a first-hand look.

Assistant Engineer John G. St. Clair developed the idea of bringing the pole to the man. He produced the perfectly detailed model of one-eighth scale. It is used now in helping the field men work out design problems.

Each component is exactly in scale, some being so tiny that St. Clair had to work within 6 in. of the light of a 200-w lamp for suf-

(*More How To on page* 116)

A communications utility used its 702 to dig 18,000' a month. One job—opening 2500'—cost one-third of the estimate . . . establishing a new low for underground cable installation.

Now you can place your cable underground at low cost

The many advantages of having electric and telephone cables underground have long been recognized. The chief obstacle has been the cost of digging and backfilling the required trench.

The new Barber-Greene 702 Ditcher has solved this problem. Despite its small size, the 702 is the newest machine in the most rugged line of ditchers made.

Prior to this new development, available machines either dug too wide for practical and economical operation, or did not have the stamina and digability required for coping with unfavorable conditions.

Utilities, contractors and railroads are now gaining the advantages of underground lines and services in virtually every area of the country.

Applications, to date, include electric power and telephone lines and house services, railroad signal systems, traffic control systems, outdoor theater wiring, installations of small gas and water lines and services, lawn sprinkling systems, and others.

Digs to 40" deep, 5" wide. The 702 can be towed or carried on a light truck. Simple dual controls permit operation from seat or from side of machine for full view of trench.

56-10-D

Write for literature on this important, new, low-cost ditcher

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

New Model YLW-96 Body with Hydraulic Derrick and Digger by YORK-HOOVER

INVEST IN THE YORK-HOOVER YLW-96 FOR SERVICE ECONOMY

DESIGNED FOR 2 MAN OPERATION

FAST OPERATING DERRICK AND DIGGER

DERRICK EQUIPMENT HANDLES 45′ POLES

A completely equipped line body with hydraulic derrick and digger located for either front or rear operation.
The hydraulic derrick has been "field proven" with hundreds in daily operation. It incorporates the expanding center leg principal with lifting capacity limited only by the chassis stability.
A pressure type hydraulic digger designed to work in those "hard to get at" places, stows with the derrick when not in use.
Modern—proven—efficient—get the complete story on the York-Hoover YLW-96 unit.

BODY DIVISION
YORK-HOOVER CORPORATION
YORK, PENNSYLVANIA

Write for Bulletin No. 941 Today!

Creative Engineering for the Public Utility Industry Since 1892

ficient illumination. Square-headed bolts were made from nails and were turned down to a diameter of 60/1,000 in. Each was threaded by a miniature die. Turning out three dozen such square-headed bolts took 20 hr.

METERING—Testing

Special Setup Tests Tong Test Ammeter

Only 5 min per meter are required to run tests on all ranges of long-test ammeters on a specially designed table in the Houston Lighting & Power Co meter laboratory. There is a 100-turn coil above the test table and past the position for the tong tester.

The 100-turn coil is tapped at 2, 5, 10, 20, 50 and 100 turns. A second coil compensates for the coils not in use. As taps are changed the compensating coil gives a constant impedance to the power source. Only resistance loading is used.

Current Adjustable

The ammeter under test is clamped around the 100-turn coil and centered by pins in a jig where it is easily observed by the tester. Current ranges of 1, 2, 3, 4, 5, and 10 amp are controlled by fixed resistors and a variable-voltage device. A regulated voltage source is used. A standard ammeter with a maximum scale of 10 amp is connected in series with the 100-turn coil, regardless of which tap is used.

Current through the coil is changed by flipping a switch. It is adjusted to exact requirements with a rheostat. The reading on the meter under test is checked against a standard.

The big advantages of the table are: There is nothing to prepare and put away; current adjustments can be made quickly and easily; and readings are readily observed.

(*More How To on page* 119)

CLASS 200 TYPE MK for More Housepower

50 AMP.

30 AMP.

Note the excellent load curves provided by Duncan's relatively low speed Class 200 meters.

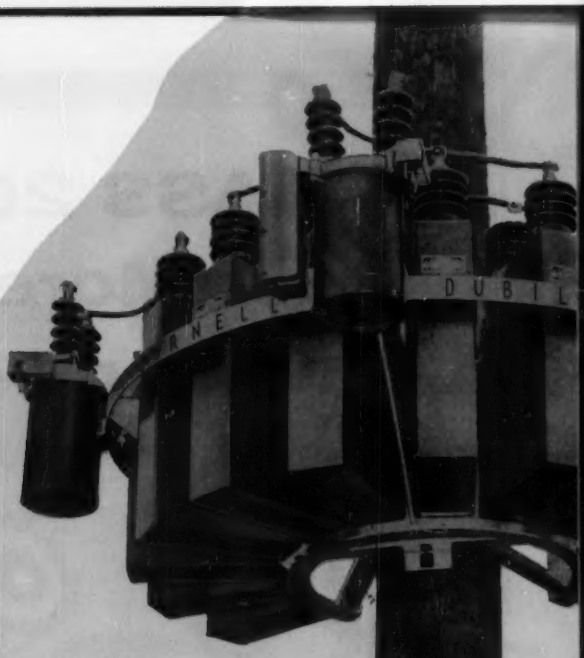
The Duncan Type MK Class 200 meter is the latest of the improved singlephase MK line, built to accurately meter a wide range of loads from a few watts to the meter's full 200 ampere capacity. Arc-resistant insulation in the electromagnet, self-contained arc gaps to by-pass electrical disturbances, and Alnico V permanent magnets to maintain calibration stability are just a few of the MK features in this meter.

Duncan pioneered the Class 200 rating with the Type MF-SE meter introduced eight years ago. This new MK offers improved performance, *plus* all of the features of the Duncan MK singlephase line. Both the 30 ampere and 50 ampere Duncan Type meters have a K_h of 12 and run at the same speed per ampere. A minimum light load safety factor of 2% is provided to avoid creep. Average starting watts is 1/3 of 1% of rated load.

LIVE BETTER ELECTRICALLY WITH FULL HOUSEPOWER

DUNCAN ELECTRIC CO., INC., LAFAYETTE, INDIANA

They have a capacity for forgetting the years...



1953
1955
1957
1958

Here's why C-D Capacitors consistently exceed all field performance requirements:

• Lowest dielectric unit stress and highest major insulation level. • Dykanol-filled bushings increase accepted flashover safety-factor, insure high level of impulse withstand. • Removable solderless connectors. • Many sections in series-parallel connection. Extremely low voltage gradient per section; less heating; no corona; longer life; lower power-factor. • Discharge resistor connected to each series section, instead of terminal to terminal. Provides effective discharge for each series group and balanced voltage distribution. • Side mounted lifting lugs—stronger and avoid risk of flashover. • Energization tested, 100 percent, to assure uniform distribution of low dielectric losses.

...1934-1957

A C-D CAPACITOR ON THE LINE KNOWS NO AGE, because internally it is built to deliver years of trouble-free service. Its life can be measured in terms of the system. Two decades of unfailing performance is not unusual.

C-D capacitors give you more hours of service per dollar because they're conservatively designed and rated, and built to take the extra surge. There's never any doubt about C-D capacitors because C-D capacitors are "Best by Field Test."

Insure low-maintenance service from your next power factor capacitor installation, by talking it over first with a C-D engineer. Just write Cornell-Dubilier Electric Corporation, Dept. D-97 South Plainfield, New Jersey.

CORNELL-DUBILIER

consistently dependable

power-factor capacitors

SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER & CAMBRIDGE, MASS.; PROVIDENCE & HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD, FUQUAY SPRINGS & VARINA, N. C.; VENICE, CALIF.; & SUB.: THE RADIART CORP., CLEVELAND, OHIO; CORNELL-DUBILIER ELECTRIC INTERNATIONAL, N. Y.

SUBSTATIONS—Maintenance

Prevents Damage, Saves Space

A. W. SHELHORSE, Supervisor, General Repair Shop, Georgia Power Co, Atlanta, Ga.

Bushing storage racks designed for side entrance, rather than through a hole in the top of the rack, save space and handling costs for Georgia Power Co. Moreover, use of the special racks prevents chipping of porcelain and permits moving of one bushing without others getting in the way.

The side-entrance racks, spaced 2½ ft apart, are fabricated from structural steel. This steel is placed to guide the cylindrical section of the bushing below the flange into position and stop it as the bushing is moved from the isle by means of the overhead crane. Contact between bushings is eliminated.

DISTRIBUTION—Maintenance

Sticks Devarnished In One Hour

Varnish is removed from a scratched hotstick in 1 man-hour by a lathe-like device used in conjunction with a portable electric sander. The device was built by personnel of Arizona Public Service Co's Metropolitan Division.

The sanding aid consists of a motor-driven chuck into which the damaged hotstick is mounted. While the device rotates the hotstick, the electric sander is applied to the stick's surface. Hand sanding formerly took 4 man-hours of tedious and careful hand labor. Following removal of the varnish, a new coat is applied.

Georgia Tech Conducts First SEE Safety Course

The first safety course for experienced electric utility safety men has been conducted at Georgia Institute of Technology in Atlanta.

Sponsored by the Southeastern Electric Exchange for its members, the 5½-day course was designed to "broaden" safety personnel to enable them to do better jobs.

RG&E Wins NEMA Contest 'Hands Up'

Rochester Gas & Electric Co won first prize in the light and power company division of 1957 Window Display Contest sponsored by Electric Housewares Section of National Electrical Manufacturers Association.

The RG&E window, shown above, was by one of those "Winners (who) have shown ingenuity and originality in their window displays of electric housewares items," said R. H. Williams, chairman of the NEMA section, and director of sales, Electronics-Appliances Division, Arvin Industries, Inc. "Many, besides tieing in with our sections program, take every advantage of the Edison Electric Institute, Live Better Electrically, and manufacturer promotions to obtain maximum benefit from the tremendous impact of these national programs," he said.

Denver is Site of '57 Power Use Workshop

The electric industry's position in the rural market will be a major topic of the Inter-Industry Farm Electric Utilization Council's fourth annual National Power Use Workshop-Conference at Denver, Col., on Sept. 29 through Oct. 1.

Conference program will stress the long-range service and financial aspects of rural load building. "The industry is pretty well agreed on the need for a coordinated power use effort that will help the farmer make more effective use of electricity," said F. H. Strong, deputy administrator of REA and chairman of the Inter-Industry Council.

The three-day meeting will bring together executives of rural electric cooperatives, investor-owned utilities, equipment manufacturers, trade organizations, electrical contractors, and agricultural college representatives.

Industry leaders will also map out strategy for a united front against the threat in rural areas of LP gas, according to J. K. Smith, member of the Council, and executive manager of Kentucky Rural Electric Cooperative Corp in Louisville. W. J. Ridout, Jr., editorial director of Electricity on the Farm magazine, will outline strategy in his talk, "Facing up to LP Gas Competition." The question of utility merchandising will also be aired.

'Family Room' Is Target of GE Fall Lighting Push

The family room has been singled out for special attention in General Electric Co's continuing "Light for Living" residential lighting program in a national advertising campaign to be launched this fall.

The program will be used to show how lighting can be used as a decorating medium in the family room, an area, according to GE, that is rapidly becoming "the most important center for family activities."

Ad schedule calls for home lighting commercial on TV shows as well as insertions in top shelter and trade magazines. A special family room setting has been created by GE's E. W. Commery, and C. E. Stephenson, noted interior decorator.

"Light for Living", now more than two years old, has found wide acceptance among utilities as a part of their residential lighting program.

Appliances Sold by TV

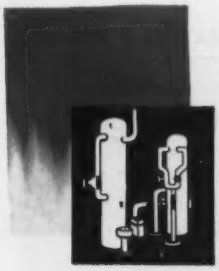
Selling the housewife on appliances through a "Homemaker of the Week" morning television show has increased sales of featured appliances in San Diego.

San Diego Gas & Electric sponsors the show, which makes no sales "pitches," but instead visits the "Homemaker of the Week" whose house is equipped with modern appliances. Recipes are demonstrated by SDG&E's home economists on featured appliances. While exact number of sales produced by the program is impossible to determine, viewer interest has been gauged by requests for recipes.

Congress on Better Living

A three-day conference of representatives from all over the country to express the needs and wants of America's 48 million families will be held in Washington, D. C., on Oct. 9-11. Called the "Congress on Better Living," and sponsored by McCall's magazine, it is an outgrowth FHA's Women's Congress on Housing.

More Selling on page 122



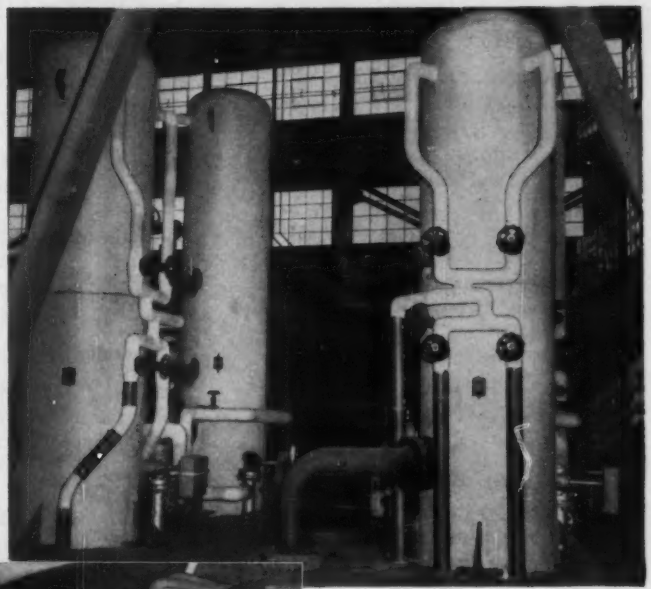
HEAT ENGINEERING by FW

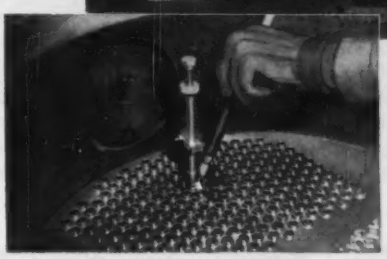
now brings you FEEDWATER HEATERS of All-Welded Design

Operating at high temperature and pressure, and subject to severe thermal shocks, feedwater heaters have long presented a major design problem in the effective prevention of leakage. Heat engineering by Foster Wheeler pioneered an early solution to this problem, with the development of the now famous "Lockhead" joint, which relieved the gasket of operating pressures and greatly extended the size and pressure range of feedwater units.

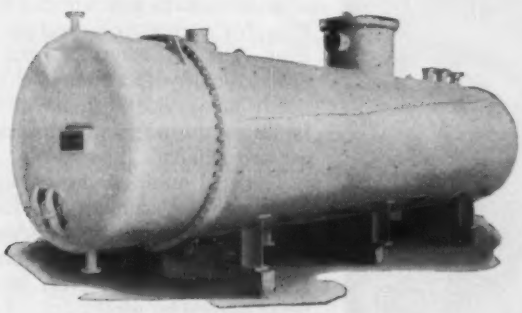
Two years ago, Foster Wheeler pioneered with the development of the first *all-welded* feedwater heater design, in which all gasketed joints are entirely eliminated. In this "bottle-tight" design, the shell-to-adapter joints, tube-to-tubesheet joints and the closure are all welded. Because there are no gaskets or bolted or rolled pressure joints anywhere in the heater, maintenance problems are virtually eliminated. Quicker start-ups are possible because there is no danger of leakage under severe thermal shocks. Each of the welds has been successfully field tested for at least six years on other equipment.

For more information on the new Foster Wheeler all-welded feedwater heater or the standard "Lockhead" line, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*





Above is the first installation of FW all-welded feedwater heaters at a large Eastern Power Station, consisting of two 175 psi low-pressure and two all-welded, 2000 psi high-pressure feedwater heaters. At left is a closeup of the FW method of welding Monel and copper-nickel tubes to carbon steel tube sheets. The tubes are welded to a clad tube sheet by the inert gas tungsten shielded arc process.



EVAPORATORS. The same Foster Wheeler engineering experience and inventiveness that developed the "Lockhead" and all-welded designs in feedwater heaters has gone into the design and construction of FW evaporators. These are available in all sizes — engineered and constructed to produce pure vapor and to provide for thermal descaling where required.

FOSTER FW WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

How to Sell 240 Electrically-Heated Homes

Monongahela Power Co started selling electric heat to boost sagging kwhr consumption. Installations are now going in at more than ten a month, despite low incomes in area and tough, low-cost gas competition

H. A. STROUD, Promotion Manager, Monongahela Power Co, Fairmont, W. Va.

Monagahela Power Co, Fairmont, W. Va., serving only 11 electrically heated homes as of Jan. 1, 1956, decided to go after the home heating market aggressively. Since starting its house heating sales campaign 20 months ago an average greater than 10 homes per month have been sold. To date, we have 250 installations, and the outlook for greater sales is constantly improving. This has been accomplished in spite of our low-income area and low-cost gas competition.

Kwhr Sales Below Average

With kwhr sales 36% lower than the average of the industry, Monongahela reviewed every available way to offset this disadvantage. The average spendable income of its customers was 27% below the national average, and the competitive natural gas rate for heating averaged about 40¢/1,000 cu ft. Despite these factors, house heating offered one important way to improve our residential sales.

To organize for the new sales program, nine residential representatives located in the company's seven divisions were trained to calculate heat losses and sell house heating. A full time electric home heating specialist was appointed in the general office. He is under the direction of the residential promotion manager, who is responsible for the program and organization training.

Held Employee Meetings

Meetings for all company employes in the system were held on company time to describe, illustrate and demonstrate sample equipment. President D. B. Potter and executive vice president E. C. Summers appeared before all groups emphasizing the need to promote faster growth. Electric water heating and features of the Live Better Electrically plans were also presented.

With no dealers located in the area in January, 1956 to sell and install heating, it was necessary to induce the fifteen present dealers to set up and take advantage of the market opportunity.

In the mountainous country of northern West Virginia very little air conditioning of homes has been sold because of the relatively favorable summer climate. As a result, only four of the installations are heat pumps. All others are of resistance type, principally ceiling cable, with only a few baseboard convector or radiant types.

Nearly all installations are in new homes. Only about four are in previously existing homes, but this market is expected to improve.

The company promotes budget billing on an eleven months basis with adjustments in the twelfth. Otherwise, all residential billing is on a bi-monthly basis.

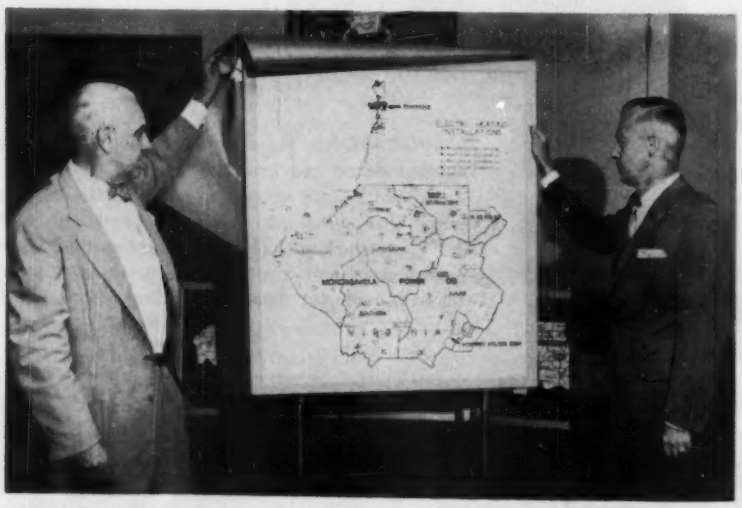
Demonstration homes, in cooperation with the home owners and dealers, have been opened to the public in every division of the company. Saturation coverage of newspaper and radio spots are used for each open house period.

Customers Enthusiastic

Customers are enthusiastic about their electric house heating. Cost of installation in new homes is lower than for competitive heating systems. The advantages of even heat distribution, perfect control at practically no service cost, no dirt, no fumes, and surprising economy of use are popular.

The coal mining industry, so important to the economy of Monongahela territory, is also delighted to see the heating of homes returning to coal—this time, however, coal is being burned by wire!

And Monongahela Power Company expects electric house heating to become a major factor in improving its residential sales.



PIN MAP showing Monongahela Power's first 250 electric heating installations is held up by author, left, and E. C. Summers, executive vice president

More Selling on page 124

CUT-AWAY VIEW OF
VICTOR NO. 729
(EEI-NEMA 58-7)
APPARATUS INSULATOR

BUILT TO TAKE A BEATING!

VICTOR Stacking Units are engineered to withstand extreme service conditions. Starting with proven design, VICTOR Apparatus Insulators are manufactured and tested with the industry's most modern equipment.

Purified Porcelain, coated with scientifically fitted glaze, gives these insulators maximum strength and service life. Utmost precision of manufacture and accurate alignment are attained by assembling shells with cap and pin in tempered, cast iron jigs. Components are carefully joined with a premium grade of insulator cement. Each insulator is tested mechanically, then subjected to vigorous high frequency and 60-cycle flashover. They are designed to withstand steep front impulse waves in addition to the normal 1.5 x 40 standard impulse wave.

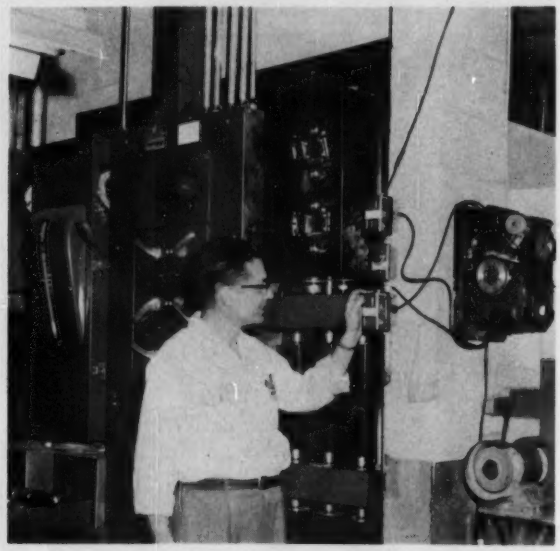
Accuracy, ruggedness and exceptional service characterize VICTOR Apparatus Insulators. You just can't buy better stacking units—at any price!

Nothing beats Porcelain **FOR ELECTRICAL INSULATORS!**

VICTOR INSULATORS DIVISION

I-T-E CIRCUIT BREAKER CO., INC. • VICTOR, N.Y.

Ceiling-mounted units with . . .



home-made input controller . . .

Heat Precision Machine Shop Electrically

GEORGE H. MAIER, Electric Heating Engineer, The Dayton Power & Light Co, Dayton, Ohio

Clean, efficient electric heat, with low initial cost and low maintenance requirements solved a serious space heating problem when the Loudon Brothers Tool Co added a new 4,800-sq ft area to their precision tool plant in Lewisburg, Ohio. Using a total of 188 kw, the new units heat both the old and new areas, replacing the existing, oil-fired, hot water heating system.

By using ceiling-mounted electric heaters, the space formerly occupied by the old boiler and associated components was freed for productive activities. The absence of combustion products eliminates considerable dirt and fumes, an important factor in a precision tool shop where cleanliness is a must. The self-contained electric heating units could be placed at strategic spots all over the shop, providing uniform wall-to-wall heating without the use of ducts, pipes, or radiators.

Maintenance and safety costs are reduced by the simplicity and safety of the electric units. Automatic thermostats provide safe, unattended heating over weekends and nights. And the absence of combustible fuels have reduced insurance rates both on the building and its contents.

The combined costs of the heaters and the enlarged electrical distribution system were appreciably less than the expense of a new central heating system of comparable capacity. Estimated annual depreciation was considerably less than that of the central heating system.

One of the key factors in the decision to heat electrically were the energy requirements. Pre-installation estimates indicated that the energy cost for electric heat was comparable to the more conventional fuel costs. The low kilowatt-hour rate earned by the electric heaters, also applied to the other power consuming equipment, thus actually lowering normal electric power costs.

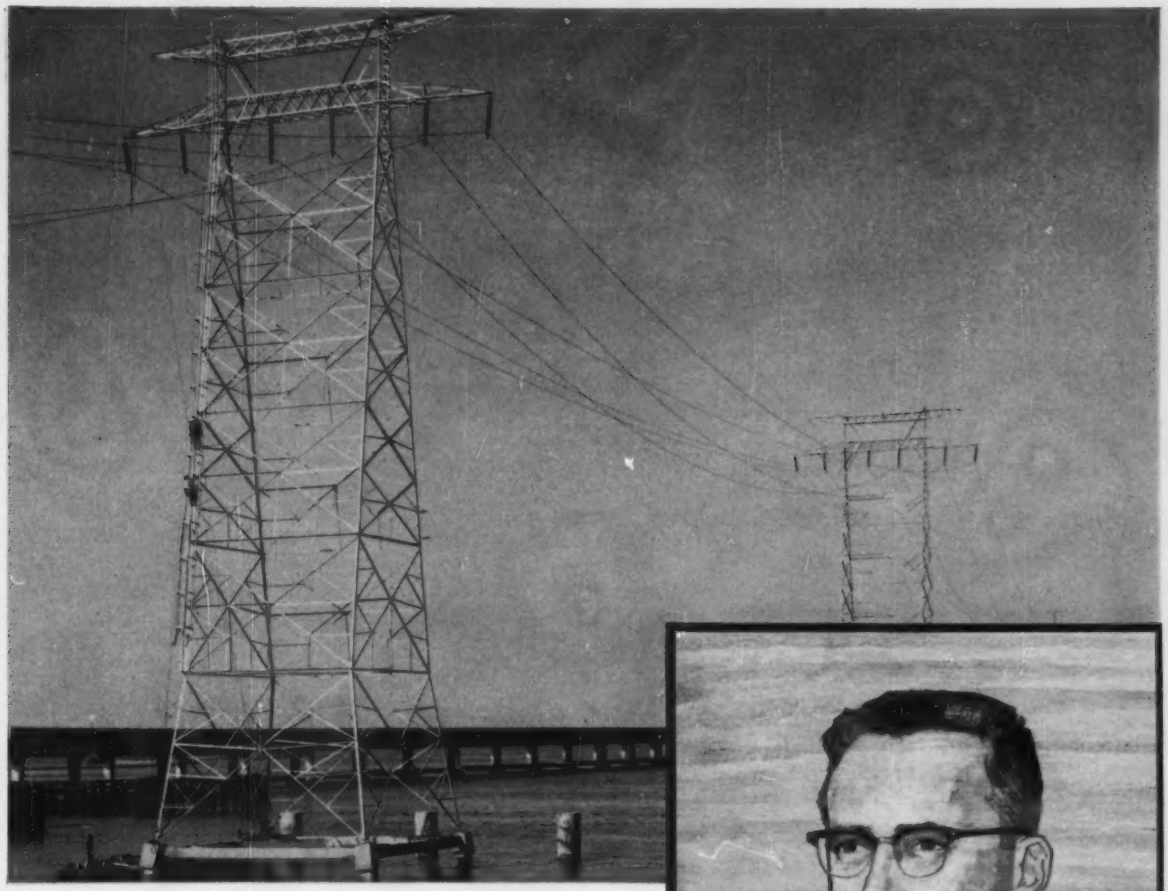
Efficiency of the system is being improved by the installation of more insulation in the building. This is financed with the savings on the initial cost of the equipment. In addition to reducing heat loss, the fire resistant insulation has brought about an additional reduction in insurance rates.

To control the demand of the heating equipment, an old time clock was altered, by addition of a ring cam and micro-switches, to function as an input controller. The unit turns the entire load on and off, as determined by various thermostats, for a load factor of about 60%, thus avoiding excessive demand charges. The clock does not control the night setting which is maintained at 50 F from 4:30 p.m. to 5:00 a.m.

When the new area was added, the plant was too large to heat with the existing system. Electric space heating was assumed to be too expensive and was not seriously considered at first.

However, since the other alternatives, installing an additional boiler or replacing the existing one with a unit large enough to heat both old and new areas, were also expensive, the Loudons asked for an estimate on the cost of electric heating. An electrical equipment supplier was sent to the plant to estimate both installation and operating costs.

Once they had the facts, the Loudon brothers said the decision was easy. Since they have had some operating experience, they are more convinced that their decision to install electric heat was a wise one.



CLYDE F. MOONEY, PRESIDENT

This was the problem in Houston . . . This is how Anchor helped solve it

The Houston Lighting & Power Company was building a major transmission line to the island city of Galveston. Crossing the Intracoastal Waterway presented a problem in transmission tower design: make them high enough to provide clearance for ships, yet not so tall as to present a hazard to aircraft.

Anchor Metals, working closely with Houston Lighting & Power Company engineers, helped design towers to meet the unusual requirements.

In approximately one month, the special towers were detailed, fabricated and shipped. And Houston Lighting & Power Company was able to continue its expansion program without serious delay in construction.

At Anchor, service and quality is the slide rule of every operation.

ANCHOR METALS INC.

HURST, TEXAS • FORT MADISON, IOWA

NEW EQUIPMENT

HV Potential Transformer . . .

. . . in classes from 92 to 161 kv is small and light. It is single core and coil unit with single bushing. Designed for line-to-neutral operation, cores can withstand line-to-line voltage in emergencies. Primary coils have circular pancake construction, are shielded to avoid localized concentration of dielectric stresses. High voltage lead is integral part of coil construction.

Cylindrical secondaries are wound on pressboard tube and assembled inside high voltage coils. Secondary leads enter junction box through small, bulk-type porcelain bushings. High voltage bushing comprises porcelain weather casing over the large, heavily taped lead. Heavily insulated tube encloses lead. Transformer proper may be removed without disturbing secondary conduit connections. Typical unit is 115-kv transformer which is 100 in. high to bushing tip, measures about 30 x 31 in. at base, and weighs 1,950 lb.
Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

Compression Connectors . . .

. . . have good resistance to thermal and galvanic action in looped splice joints of aluminum-to-aluminum or copper-to-aluminum. Known as Penn-Sleeves, they are forged from pure aluminum to assure high conductivity and strength. Large, smooth entering radii simplify conductor entry, minimize stress concentration and chafing from vibration. Solid, integral barrier isolates conductors to prevent electrolytic action. Contact surfaces are coated with oxide inhibitor.

Color-coded end caps need not be removed to install wires. Cable accommodations are stamped in center of sleeve, are not disturbed by crimping. Type PSC has 0.52-in O. D., takes conductor sizes from 10 stranded or 8 solid to 2 stranded or 1/0 solid at each end. Type PSK has 0.65-in. O. D., accommodates ranges from 10 stranded or 8 solid to 1/0 stranded.
Penn-Union Electric Corp, Erie, Pa.

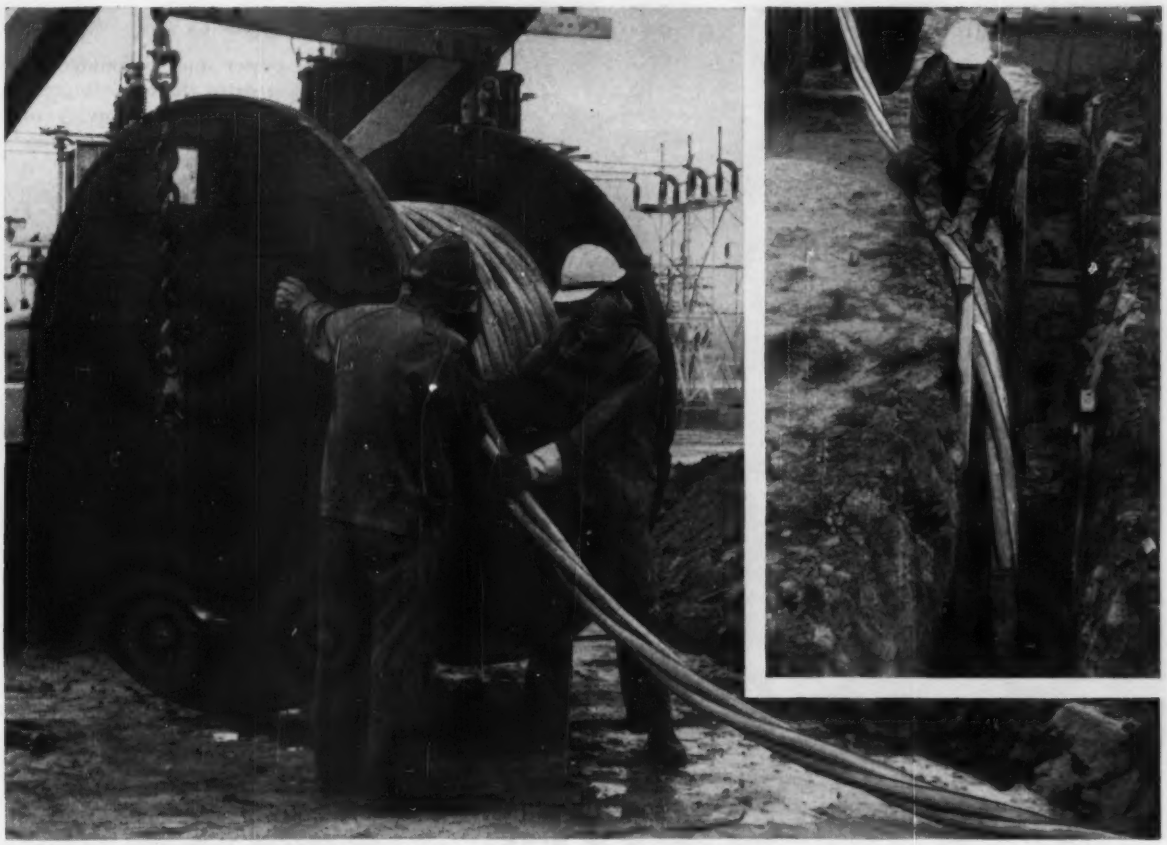
Network Protectors . . .

. . . with Class H insulation as optional feature are available in five models: 1,600, 2,000, 2,500, and 3,000 amp at 216Y/125 v; 3,000 amp at 480Y/277 v. Insulation design throughout the protector is on 600-v basis. Fuses used with 216Y/125-v system can also be used on 480Y/277-v system without change in rating. Small auto-transformers for Y systems and zig-zag transformers for delta systems are used to operate network relays at higher voltages. Motor, motor controller, and shunt trip use series resistor for higher voltage operation.
General Electric Co, Schenectady 5, N. Y.

Water Analyzers . . .

. . . continuously analyze and record water hardness and silica content. Known as Quantichem, the automatic analyzers make photo-electric measurement of the amount of light absorbed by silica, calcium, or magnesium ions when a beam is passed through a glass tube. Silica analyzer has range from zero to 0.05 ppm; total hardness analyzers, from zero to three or five ppm, with sensitivities of 0.03 and 0.05 ppm, respectively, calculated as calcium carbonate. Each silica analysis takes 12 min; each hardness, 6 min.
Milton Roy Co, 1300 E. Mermaid Lane, Philadelphia 18, Pa.

(*More New Equipment on page* 128)



BURIED TO SAVE COSTS

Neoprene protects Baltimore Gas and Electric cables from electrolytic and chemical corrosion

Baltimore Gas and Electric Co. recently installed two 35-Kv triplex cables between a Master Substation and an industrial company's switching station nearby. The paper-insulated cables are sheathed with copper-bearing lead. Neoprene protective jackets are bonded to the sheaths. Cables are buried directly in the earth at a depth of 33″ and surrounded by a sand bedding. A 2″ concrete slab protects them from mechanical damage.

By burying the cables, the company was able to cut construction costs materially. The neoprene jacketing provides needed corrosion protection because it prevents deterioration of the lead sheath due to galvanic cell action and chemical corrosion.

Baltimore Gas and Electric has also installed neoprene-over-lead cables at other substations and a large shopping center, which is supplied with power from a 4000′ underground loop surrounding the whole area.

Installations like these offer added proof of neoprene's acceptance for wire and cable jacketing. Of all resilient materials, only neoprene has balanced resistance to sunlight and weathering, oils and chemicals, heat, flex cracking, abrasion and cutting, oxidation and aging.

Ask your supplier about wire and cable jacketed with neoprene. It's available in single and multiple conductor types and voltage ratings to meet your requirements. Mail the coupon below to get the ELASTOMERS NOTEBOOK with actual on-the-job reports of neoprene's performance in a wide range of industrial products.

DU PONT

Better things for better living
. . . through chemistry

NEOPRENE
— made by Du Pont for 25 years

E. I. du Pont de Nemours & Co. (Inc.)
Elastomer Chemicals Dept. EW-9
Wilmington 98, Delaware

Please put my name on the mailing list for the Elastomers Notebook.

Name_____
Position_____
Firm_____
Address_____
City, State_____

MAIL THIS COUPON NOW . . . WHILE YOU'RE THINKING ABOUT IT

Each of the two illustrated troughs can carry as much cable as all of the paralleling conduit

COPE CABLE TROUGH SAVES STEEL BY THE TON!

Problem. 100 miles of cable to be supported in a New Jersey power generating station.

Solution. A careful cost analysis of available methods and materials convinced plant engineers that Cope's expanded-metal cable trough was the best choice. Why? Among other reasons, it meant a saving of more than a ton of steel for every 60 feet of trough installed, as compared to conduit . . . a total saving in excess of 250 tons of steel for the 15,000 ft. of trough required for the completed job!

Here's How You Save. *One* 10 foot section of 24" width Cope trough supports as many cables as 16 lengths of 4" conduit and it only weighs 54 lbs., compared to 575 lbs. for this same amount of conduit. This adds up to real economy regardless of the size of your installation. Cope's expanded-metal cable trough simply uses *less* steel to do the job and obviously this can mean substantial savings for you!

Cuts Labor and Maintenance Costs, Too. Design and construction features of lightweight Cope trough speed installation of space saving systems—even in the most cramped quarters. Easy-to-get-at trough simplifies cable inspection and repair . . . provides ready re-routing and facilitates system additions.

You save *three* ways when you specify Cope cable supporting equipment . . . trough, ladder or channel.

- LOWER FIRST COST
- LOWER INSTALLATION COSTS
- LOWER SYSTEM MAINTENANCE COSTS

Discuss these advantages for *your* installation with a qualified Cope representative—or write to T. J. Cope Division, Rome Cable Corporation, Collegeville, Pa.

1000

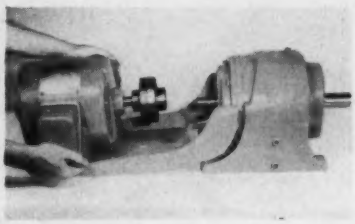
T. J. COPE *Division*

ROME CABLE CORPORATION

Hole Digger . . .

. . . has power source mounted directly over drive shaft to eliminate power take-off, flexible coupling, or universal for added downward pressure and positioning flexibility. It uses interchangeable augers, can dig holes at diameters between 4 and 24 in. Standard auger is 6-ft long, with extensions to 25 ft. Unit features torque limiter and finger touch control for added safety. Equipment is distributed by Graybar Electric Co, Inc.

Roper Manufacturing Co, Zanesville, Ohio



Gear Motors . . .

. . . in new line are compact, flexible, and easy to maintain. They use a double helical gear design, have a built-in provision for making ratio changes by changing pinion and gear in first stage only. Line is offered in three basic components: integral type, with motor and drive in single unit; all-motor type, with drive motor coupled to gear reducer and mounted on common carrier; separate helical speed reducer that works with variety of prime movers.

Three basic types of speed reduction are offered: single reduction, offset shaft for 780 to 350 rpm; double reduction concentric shaft for speeds from 350 to 37 rpm; triple reduction concentric for 30 to 13.5 rpm. Sizes from one to 10 hp are now available.

General Electric Co, Schenectady 5, N. Y.

Polyester Housing . . .

. . . for distribution transformers in underground installations is lightweight, impervious to fire and corrosion, and has permanent coloring. Two men can install the two-piece (*More New Equipment on page* 130)

"I'll be right down, Joe... These PLP DEAD-ENDS are a cinch to Install"...

Installation of a PLP Dead-End is no trick at all. It's fast and it's done right the first time, by hand. No need to recheck later.

The resulting installation is neat . . . safe . . . permanent.

The streamlined appearance speaks for itself. Safety is assured because there are no sharp edges, no concentrated stress or fatigue point.

A speedy installation, and trouble-free service are reasons why linemen prefer PLP Service Entrance Dead-Ends. Call a PLP Representative today, ask for a demonstration.

PX-76

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents pending.

PLP

PREFORMED LINE PRODUCTS COMPANY

[illegible] Clair Avenue Cleveland 3, Ohio

TELEPHONE: CLEVELAND EXPRESS 1-3571

It's NEW!

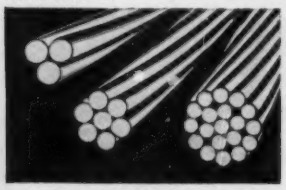
Wire that combines the strength of steel with the high corrosion resistance of aluminum

ACCO *It's Aluminized!*

PAGE STRAND

PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U.S. and foreign patents.

Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications. Can be used with Preformed Guy-Grip dead-ends made of ACCO ALUMINIZED Wire, or with galvanized pole hardware. Here is evidence of ACCO ALUMINIZED Steel Strand's superiority: salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.*



Also...PAGE *Aluminized* ACSR CORE WIRE

Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable. Product quality control is assured by a special testing procedure mutually developed by PAGE and ALCOA.

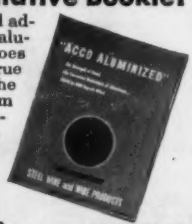
ALL STANDARD GRADES

PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemans-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54-T and A-363-55-T.

NOTE: We will continue to make and market PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for **Booklet DH537-A.**



ACCO for Better Values

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

ACCO

Polyester Housing

(*Continued from page* 128)

housing which weighs less than 300 lb. Reduction in maintenance and in installation can be expected.

Measuring 84 in. high by 60 in. in diameter, the vault can house any single-phase distribution transformer up to 167 kva including the disconnects. Its green color blends with the landscape.

Westinghouse Electric Corp, Box 2278, Pittsburgh, Pa.

Systems Development Kit...

. . . for automation and instrumentation applications determines proper torque, synchronous, or servo motor. It eliminates necessity of buying individual sample motors for test and application purposes. Kit contains motors and components to assemble 32 motors, with or without integral gear reduction units and includes instruction manual.

National Pneumatic Co, Inc & Holtzer-Cabot, 125 Amory St, Boston 19, Mass.

Ultrasonic Generator . . .

. . . for bench model cleaners is designed for unattended and quick cleaning of instruments, transistors, anti-friction bearings, and other small parts that must be dirt-free before assembly. For cleaning-rinsing and other two-step operations, generator output can be switched between transducers mounted in separate tanks.

Known as the Sonogen model AP-25-B, it has rated r-f output of 125 w average power, with peak at 500 w. It measures 10x16x12 in.

Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn.

Digital Control Computer...

. . . for automatic control of industrial plants is completely transistorized. Designated the RW-300, it can be applied to paper manufacturing, metals processing, chemical

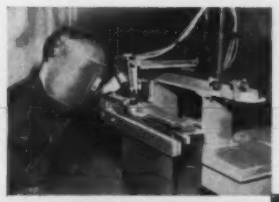
(*More New Equipment on page* 132)

TOBE...tomorrow's certainties out of today's experiments!

CAPACITOR PROGRESS does not start in the laboratory. It has its origin in the needs of utility companies. TOBE translates those needs into the research that makes tomorrow's progress possible.

RESULT: progressive engineering of the type that has *resulted in* the famous TOBE 50-KVAR capacitor . . . *In* a stainless steel container at no extra cost . . . *In* low losses that mean more correction for less dollars . . . *In* design and processing procedures that assure thermal stability over the entire operating range. Yes, it will pay you to investigate TOBE TEMPALL power capacitors today! Write Tobe Deutschmann Corporation, Norwood, Mass. or call Norwood 7-2620, collect—for further information on power capacitors today.

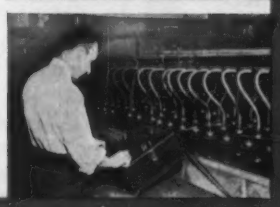
HERE'S WHY BETTER POWER CAPACITORS COME FROM TOBE—



Heliarc weld virtually seamless stainless steel container.

One piece wet-process solder-sealed porcelain terminals equipped with self-locking neoprene caps.

Special TOBE assembly control mechanism results in greater product uniformity.

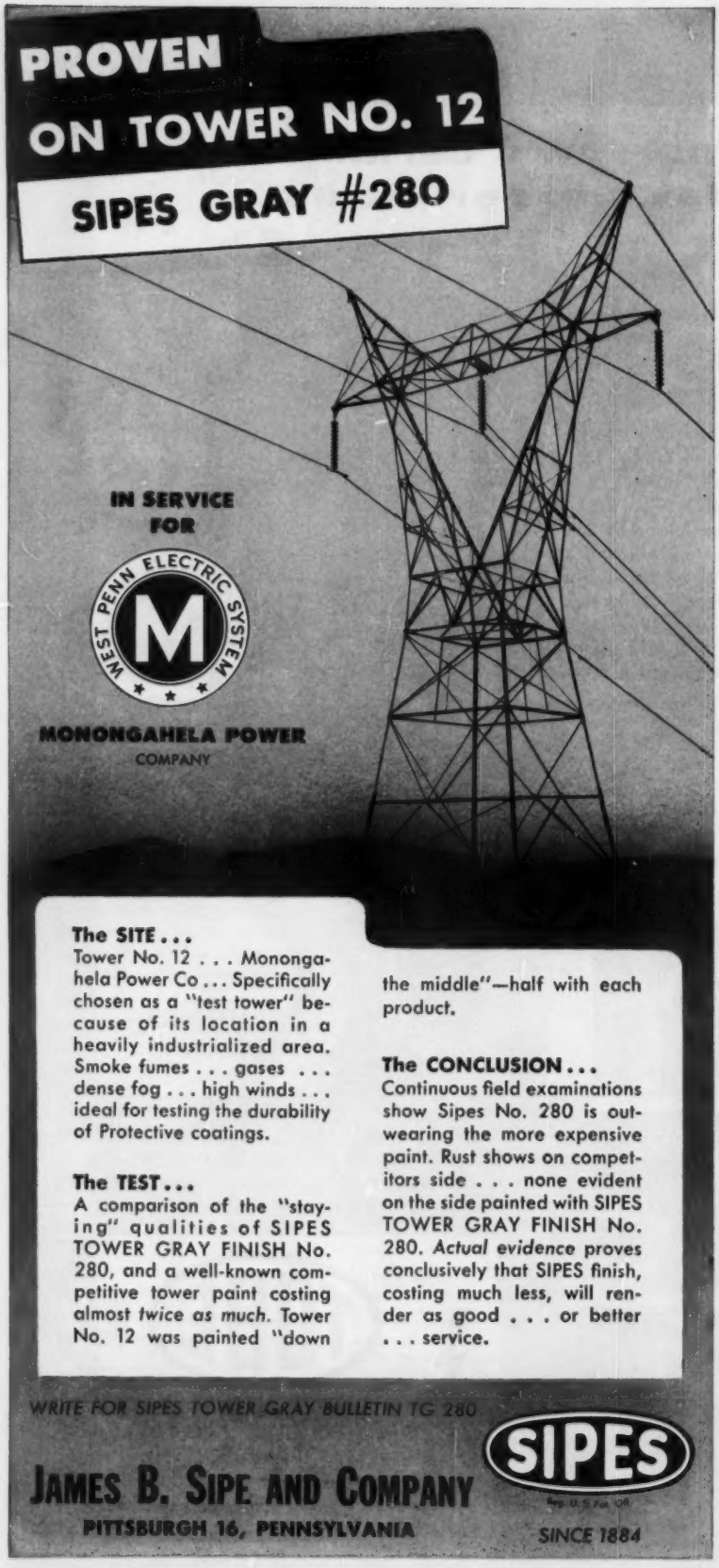


Another TOBE exclusive: checks on each capacitor during every step of processing.

Look to TOBE for progress. Since 1926 persistent research, trustworthy engineering, rigid production standards.

TOBE

TEMPALL CAPACITORS


PROVEN
ON TOWER NO. 12
SIPES GRAY #280
IN SERVICE FOR
WEST PENN ELECTRIC SYSTEM
MONONGAHELA POWER COMPANY
The SITE . . .
Tower No. 12 . . . Monongahela Power Co . . . Specifically chosen as a "test tower" because of its location in a heavily industrialized area. Smoke fumes . . . gases . . . dense fog . . . high winds . . . ideal for testing the durability of Protective coatings.
The TEST . . .
A comparison of the "staying" qualities of SIPES TOWER GRAY FINISH No. 280, and a well-known competitive tower paint costing almost twice as much. Tower No. 12 was painted "down the middle"—half with each product.
The CONCLUSION . . .
Continuous field examinations show Sipes No. 280 is outwearing the more expensive paint. Rust shows on competitors side . . . none evident on the side painted with SIPES TOWER GRAY FINISH No. 280. Actual evidence proves conclusively that SIPES finish, costing much less, will render as good . . . or better . . . service.
WRITE FOR SIPES TOWER GRAY BULLETIN TG 280
JAMES B. SIPE AND COMPANY
PITTSBURGH 16, PENNSYLVANIA
SIPES
SINCE 1884

Digital Control

(*Continued from page* 130)

manufacturing, oil refining and numerous other industrial operations. It will read process instruments, check readings against process aims, determine corrective action, and start or adjust mechanisms on supervised control loops.

Unit has good performance on engineering and scientific calculations, can maximize, minimize, average, interpolate, extrapolate, integrate, correlate, and solve equations. It accepts input from wide variety of process instruments. Computer can be tailored to specific applications.

Ramo-Woolridge Corp, 5730 Arbor Vitae St, Los Angeles 45, Cal.

Aerial Platform . . .

. . . has all operating controls on platform, is self-propelled. The 3-wheeled unit has 150-lb platform capacity, regardless of boom position. Man on platform controls forward and reverse drive, steering, boom elevation and position. Boom swings through 36-deg. arc. All operations except vehicle drive are foot-controlled.

Hydraulic pump raises boom to 13 ft, provides 18 ft working level. Steering is done by braking one or more wheels. Third wheel is pivot, providing high maneuverability.

Pitman Mfg Co, 300 W 79th Terrace, Kansas City, Mo.

MORE NEW PRODUCTS

Vaportight and dustproof **decorative lighting fixture,** takes lamps up to 200 w, A25 max., mounts on condulets or outlet boxes.—Crouse Hinds Co, Wolf & Seventh N St, Syracuse, N. Y.

A-c motors for induction, torque, or hysteresis synchronous applications have outputs up to one hp. —Induction Motors Corp, 570 Main St, Westbury, L. I., N. Y.

(*More New Products on page* 134)

ANDERSON ELECTRIC

Performance at Point-of-Contact is what counts! Anderson Electric's new U-bolt aluminum parallel groove connector with COVER ALL spacer . . . maintains cable configuration . . . speeds installation . . . provides more area contact . . . increases range . . . increases pull-out strength . . . assures inhibitor protection.

ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama

Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATIONS • TRANSMISSION • DISTRIBUTION

ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

Mr. Engineer...

Mr. Contractor...

HUSKY
CABLE SUPPORT SYSTEMS
are NOT ONLY
RECOMMENDED and APPROVED
by ALL Leading
CABLE MANUFACTURERS
They are actually SOLD by
MOST of the large cable
manufacturers.

NO OTHER
POWER CABLE SUPPORT
SYSTEM HAS THIS DISTINCTION.

DO YOU KNOW WHY??

The only "electrically sound" system; let us explain...
or...ask your cable manufacturers representative.

ALSO...
Send for your copy of the story of
"CABLE IN-FREE-AIR"

AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

HUSKY PRODUCTS, INC.
5300 VINE STREET, CINCINNATI 17, OHIO

Solvent **vapor degreaser,** Model 10, cleans minimum of 100 lbs per hr with non-flammable solvent, has 14.5-in. diam., 10.5-in. cleaning height—Tect, Inc, Cortland Ave & Erie St, Dumont, N. J.

Precision **Wheatstone bridge** has range of 0.01 ohm to 1.111 megohm, is accurate to within ± (0.05% + 0.001 ohm) up to 100 megohms and within ± 0.5% above 100 megohms—Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.

Frame drop-out for cable trough has rounded edges to protect insulation and bolts securely to bottom of trough. It fits 6, 9, 12, 18, and 24-in. trough.—T. J. Cope, Inc, 3rd & Walnut St, Collegeville, Pa.

Constant voltage reference supply, Model CVR-10, replaces No. 6 dry cell in instruments and controls. It provides 1.5-v, 6-ma output with 0.25% stability for inputs in 108 to 125-v range—Performance Measurements Co, 15301 W. McNichols Rd, Detroit 35, Mich.

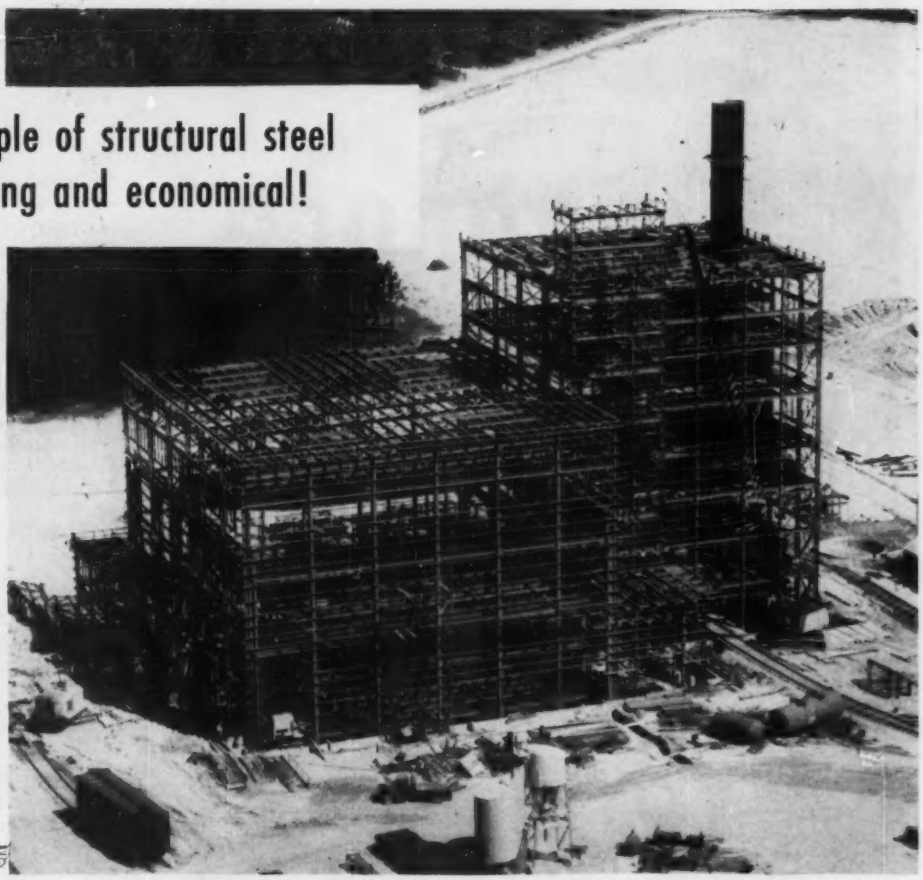
Line of eight **thermometers** have mercury actuated elements to assure uniform accuracy. Recorder, recorder-controller, indicator, and indicator-controller models are available. — Wheelco Instruments Div, Barber-Colman Co, Rockford, Ill.

Submersible motors, rated ⅓ to ¾-hp, are cooled by liquid they are in. For high reliability application, they can drive pumps in casings with diameters of 4 in. or larger.—Franklin Electric Co, Bluffton, Ind.

23-kw silicon single-phase **bridge rectifiers** are rated 50 amp rectified dc with convection cooling and 120 amp with 1,000-lfm forced air cooling. — International Rectifier Corp, 1521 E Grand Ave, El Segundo, Cal.

Sensitive industrial **control relay** is adjustable for sensitivities from 100,000 to 20 megohms input impedance, controls loads up to 60 amp from 2-ma source—Ebert Electronics Corp, Queens Village, N. Y.

Another example of structural steel at work...strong and economical!



Mississippi Power Company Plant, Gulfport, Mississippi.

"Power House" Team for Power House (Steam)

Working as a "team," Ingalls offers specialized service in the steel fabrication, plate work and erection of every type of structure.

Here you see a 75,000 kw power house under construction for the Mississippi Power Company at Gulfport, Mississippi. Working as a team, the Ingalls Iron Works and its Birmingham Tank Division fabricated more than 2,000 tons of structural steel and plate work which was erected by Ingalls Steel Construction Company.

Ingalls has served 46 of the nation's leading power companies in 22 states. In many instances, the Ingalls plants have worked as a "team". In other instances, each plant has worked independently, furnishing either fabricated steel, plate work, or erection.

If you are contemplating a new structure, call on Ingalls—for 47 years fabricators of steel.

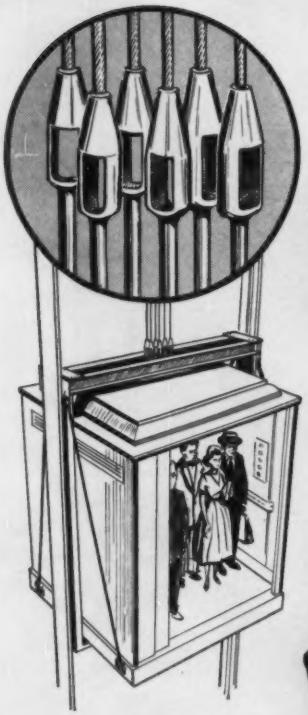
The Ingalls Shipbuilding Corporation
Shipyards: Pascagoula, Mississippi; Decatur, Alabama
Sales Offices: New York, Chicago, Philadelphia, Washington, Houston, New Orleans, Atlanta

The Ingalls Steel Construction Company
Sales Offices: New York, Chicago, New Orleans, Pittsburgh, Houston, Atlanta

The Ingalls Iron Works Company
Sales Offices: New York, Pittsburgh, Chicago, Houston, New Orleans, Atlanta

Birmingham Tank Company
Sales Offices: New York, Pittsburgh, Chicago, Houston, Atlanta, New Orleans, Pascagoula

THE
INGALLS
INDUSTRIES
Executive Offices:
BIRMINGHAM, ALABAMA



FORGED, of Course!

STRONGER
TOUGHER LIGHTER

BTC Drop Forged Suspension Clamps

Wide range of sizes
Dimensional fidelity—oversize clamps unnecessary
No failure under severe loading
No excessive wear on connecting surfaces
Specify the best—BTC Hi-Line Hardware

The BREWER-TITCHENER CORPORATION
HI-LINE HARDWARE DIVISION • CORTLAND, N.Y.

CATALOGS–BULLETINS

• **LIGHTING FIXTURES:** Ideas and applications of lighting are presented in 32-page Portfolio of Decorative Lighting Fixtures published by Lightolier, 346 Claremont Ave, Jersey City, N. J.

• **GEARMOTORS AND PACKAGE DRIVES:** Horizontal, vertical, right angle, open, enclosed, explosion-proof, ac and dc units are illustrated in an 8-page booklet published by Westinghouse Electric Corp, P.O. Box 2099, Pittsburgh 30, Pa.

• **METER AIDS:** Catalog MGS-1 describes the line of meter holders and meter readers' card holders made by Aluminum Box Shop, P.O. Box 912, Coral Gables, Fla.

• **COMPANY STORY:** A history of the Okonite Co from its start is available in "A Measure of Achievement" from the company at Passaic, N. J.

• **CAPS AND CONDUCTORS:** Descriptions of its line of 125 or 250-v vinyl caps and connectors are published in catalog No. 2-3-57 by Royal Electric Corp, Pawtucket, R. I.

• **LIGHTING EQUIPMENT:** Incandescent and mercury lighting equipment in its Miller-Ivanhoe line are covered in a 12-page pamphlet by Miller Co, Meriden, Conn.

• **CAPACITORS:** An 84-page catalog of its line of capacitors—power, industrial, and MIL-C-25 types—is printed by Electrical Utilities Co, La Salle, Ill.

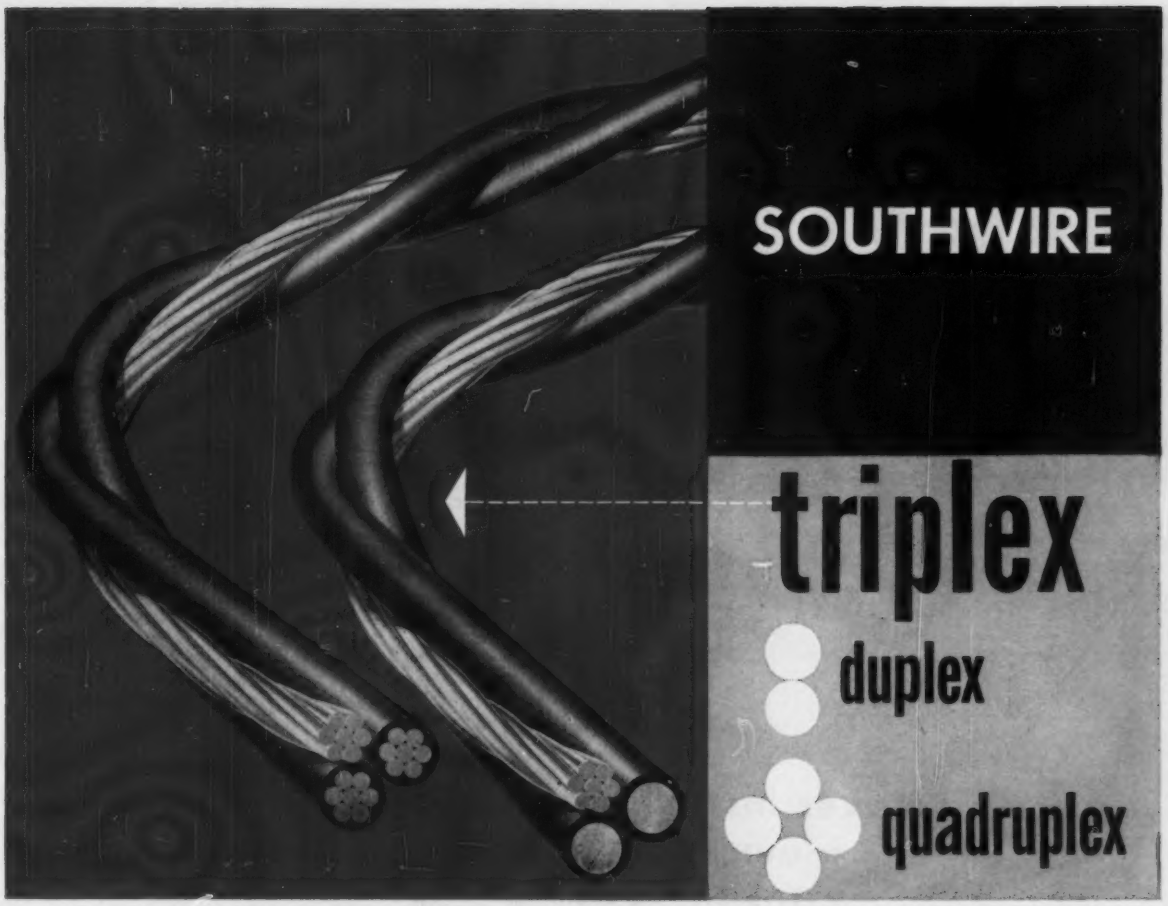
• **POWER SWITCHES AND RECLOSERS:** Bulletin PSE2 describes L-M line of vertical-break power switches. Catalog bulletin CR1C covers the company's Kyle Type R oil circuit reclosers. Write Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

• **PLUG-IN-BUSWAY:** Type FVK Flex-A-Power Plug-in Busway details and advantages can be found in Bulletin GEA-6470A issued by General Electric Co, Plainville, Conn.

• **DISTRIBUTION TRANSFORMERS:** Information on its dry-type power distribution transformers is released in Bulletin DT-47-1 by Land-Air, Inc, Subsidiary of California Eastern Aviation, Inc, 7444 W. Wilson Ave, Chicago 31, Ill.

• **PRESSURE GAUGES:** Helicoid Gages, pressure instruments for industrial, processing, and chemical applications, are presented in a 32-page booklet, Catalog G-52, by Helicoid Gage Division, American Chain & Cable Co, Inc, Bridgeport 2, Conn.

(*More catalogs on page* 138)



NEOPRENE or POLYETHYLENE
Self Supporting Service Cable

Southwire...a name synonymous with service...offers a complete range of self supporting service drops to meet every possible need.

AAC...ACSR...or Copper. In every combination to customer specifications. All are manufactured, from start to finish, in our own modern plant.

Southwire Neoprene or Polyethylene is especially designed for low-voltage installations. Every service drop meets or exceeds ASTM specification.

Whatever your requirements, specify Southwire and get the fastest, most reliable delivery possible—by our own fast fleet of trucks.

SOUTHWIRE PRODUCTS

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene Weatherproof Copper, Aluminum and Triplex
- Polyethylene Weatherproof Copper, Aluminum and Triplex
- Southwire Vinyl Weatherproof Copper, Aluminum and Triplex U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

Southwire Company

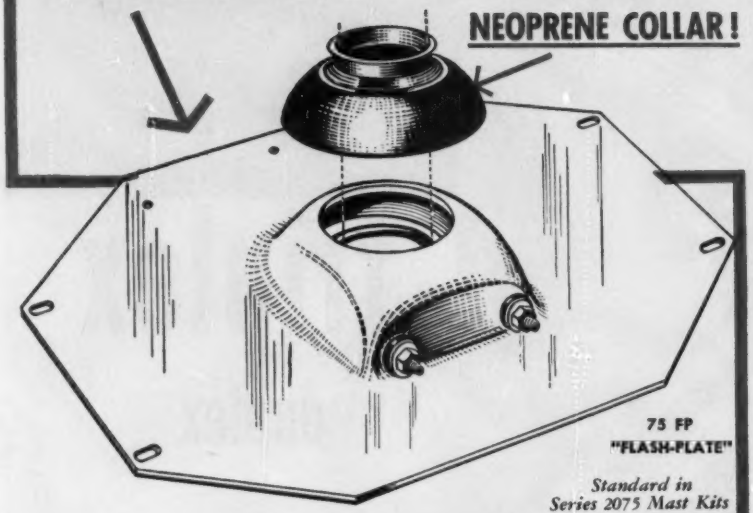
TErrace 2-6311 CARROLLTON, GEORGIA

"SOUTHWIRE MEANS SERVICE"

The expansion of Parson Station

new

from Porcelain Products . . . combination roof-plate and flashing with NEOPRENE COLLAR!

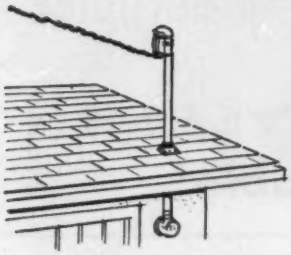


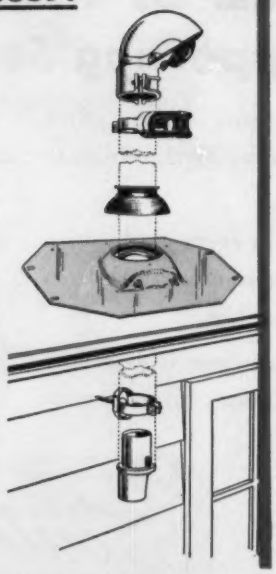
Standard in Series 2075 Mast Kits

Makes installation

- **QUICKER—fewer parts**
- **EASIER—no caulking**

at Less Cost!





Now, Porcelain Products Mast Kits feature FLASH-PLATE, a combined roof-plate and flashing, plus a lifetime, watertight Neoprene collar. The "one-piece" feature makes Porcelain Products Mast Kits easier to install . . . provides a stronger, longer lasting, safer entrance mast . . . ALL AT *LESS* COST TO YOU!

Flash-plate is heavy, 14 gauge galvanized plate. It supports a 2″ or 2½″ mast on any roof, neatly and effectively, *with no caulking* needed. Available through recognized electrical distributors or write for further information.

ELECTRICAL PORCELAIN SINCE 1894

63 years

Porcelain Products, Inc. PP INC.

FINDLAY, OHIO

Catalogs–Bulletins

(*Continued from page* 136)

• **HIGH TEMPERATURE INSULATION:** Qualities and uses of Supermica 560 for applications over 500C are given in a flyer by Mycalex Corp of America, Clifton, N. J.

• **TRUCKS:** Complete line of basic truck models and attachments for mechanical handling operations is covered in a 12-page guide prepared by Hyster Co, 2902 N. E. Clackmas Street, Portland 8, Ore.

• **HEAVY DUTY SWITCHES:** Type F, IN, E, V, OP, EX, LS, and ML series switches are listed in a Micro Switch catalog printed by Micro Switch Division, Minneapolis-Honeywell Regulator Co, Freeport, Ill.

• **ELECTRICAL BOXES AND CABINETS:** A 24-page catalog, No. 10, describing its line of junction and pull boxes, conduit boxes, and hinged cabinets is issued by Spring City Electrical Mfg Co, Spring City, Pa.

• **DRIVES AND COUPLINGS:** Flexidyne line of dry fluid drives and couplings are now capable of use with motors rated up to 75 hp and 1750 rpm. For descriptions, write Dodge Mfg Corp, Mishawaka, Ind., for Bulletin A-640-A.

• **ULTRASONIC TESTING:** Methods of finding flaws and corrosion rates by its ultrasonic gauges are explained in Bulletins V-301 and V-302 of Branson Instruments, Inc, Stamford, Conn.

• **WIRE ROPE:** Bulletin DH-91 describes ACCO Signalkore wire rope's advantages, dimensions, and strengths. Write Wire Rope Divisions, American Chain & Cable Co, Inc, Wilkes-Barre, Pa.

• **CABLE FITTINGS:** Interlocked armor cable terminators, cable supports, and splicing sleeves in Engineering Bulletin 135-A offered by O. Z. Electrical Mfg Co, Inc, Brooklyn 17, N. Y.

• **GAUGES:** Fischer & Porter Co has published Catalog 51-1450 describing its line of small-case instruments for indicating, transmitting, and controlling, pressure and temperature. Write the company, Hatboro, Pa.

• **FOUR-CYCLE ENGINES:** A 16-page bulletin, No. 257, gives data on diesel, Duafuel, and spark ignition gas engines for power plants manufactured by Nordberg Mfg Co, Milwaukee 1, Wis.

• **AUTOMATIC CONTROL SYSTEMS:** Operation of combustion, feedwater, feedpump, and soot-blowing C-V control systems at Sutton Station of Carolina Power & Light Co is explained in Bulletin No. 1032 by Copes-Vulcan Division, Blaw-Knox Co, Erie, Pa.

(*More Catalogs on page* 151)

HOW WESTINGHOUSE HELPS HARNESS A RUNAWAY DESERT BOOM

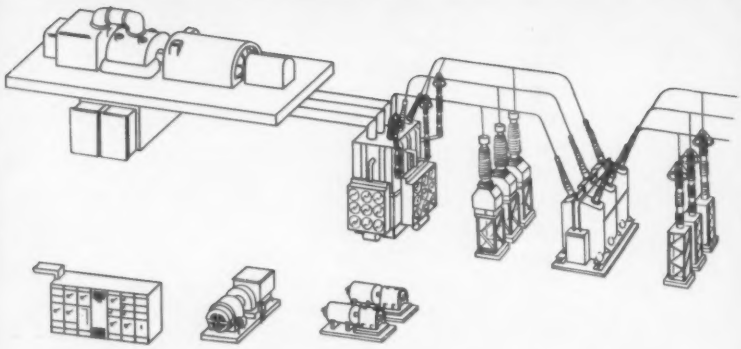
"Runaway desert boom" are the words of a feature writer for the Albuquerque Tribune, as he described the industrial expansion that has abruptly doubled the city's population and multiplied its appetite for electric power four times.

How Public Service Company of New Mexico expanded Person Station to handle this upsurge, and the Westinghouse equipment they used, is unfolded on the following pages.

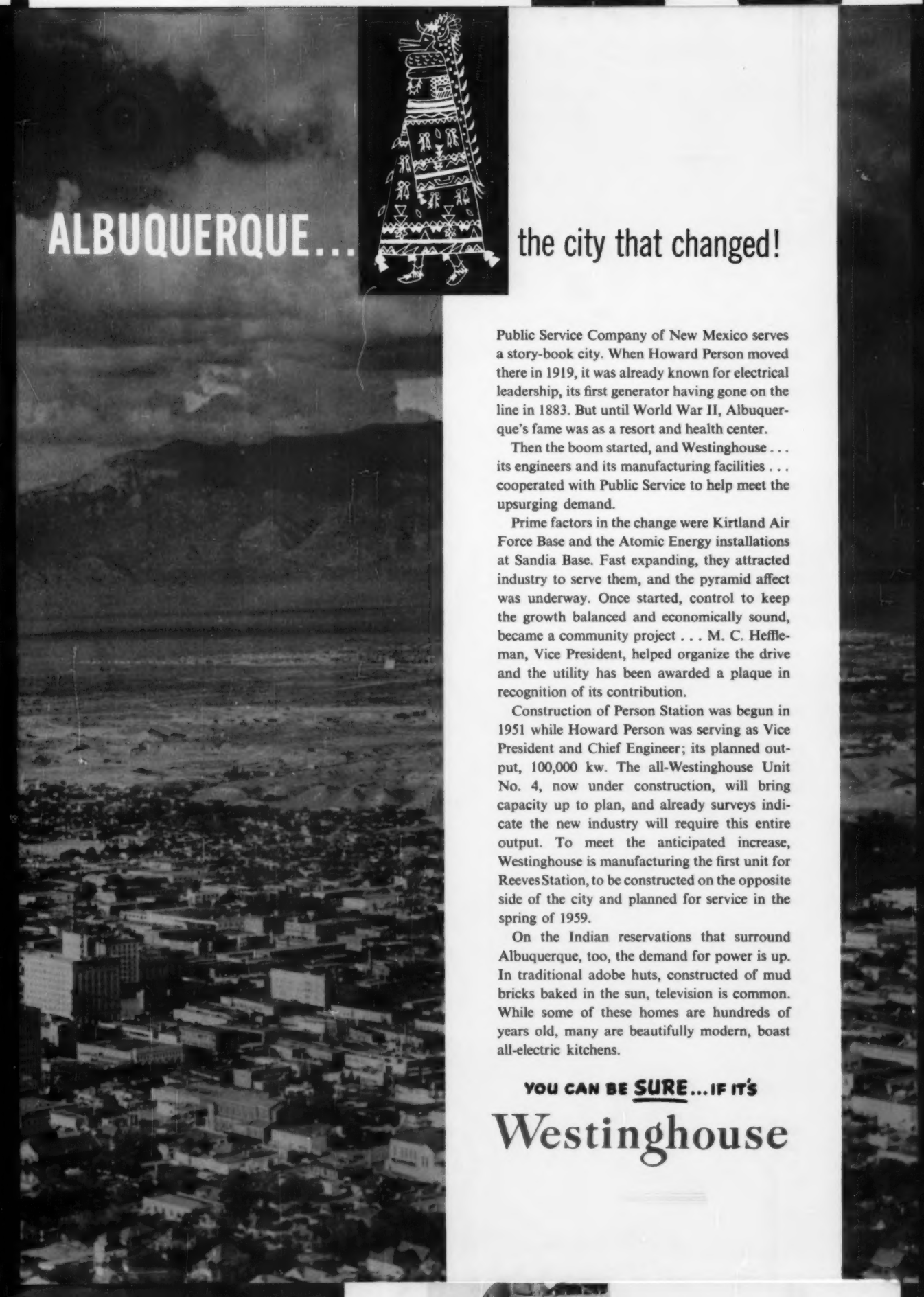
YOU CAN BE SURE...IF IT'S Westinghouse

Howard Person (far right) Consultant to Public Service Company of New Mexico. With him is D. H. Pollard of Westinghouse.

WESTINGHOUSE EQUIPS PERSON UNITS 3 & 4 TO POWER-UP



Indians on the reservations "Live Better Electrically." Above diagram shows the array of Westinghouse coordinated equipment being installed in Person Station Unit No. 4. Stearns-Roger are the Consulting Engineers and Constructors.



ALBUQUERQUE... the city that changed!

Public Service Company of New Mexico serves a story-book city. When Howard Person moved there in 1919, it was already known for electrical leadership, its first generator having gone on the line in 1883. But until World War II, Albuquerque's fame was as a resort and health center.

Then the boom started, and Westinghouse . . . its engineers and its manufacturing facilities . . . cooperated with Public Service to help meet the upsurging demand.

Prime factors in the change were Kirtland Air Force Base and the Atomic Energy installations at Sandia Base. Fast expanding, they attracted industry to serve them, and the pyramid affect was underway. Once started, control to keep the growth balanced and economically sound, became a community project . . . M. C. Heffleman, Vice President, helped organize the drive and the utility has been awarded a plaque in recognition of its contribution.

Construction of Person Station was begun in 1951 while Howard Person was serving as Vice President and Chief Engineer; its planned output, 100,000 kw. The all-Westinghouse Unit No. 4, now under construction, will bring capacity up to plan, and already surveys indicate the new industry will require this entire output. To meet the anticipated increase, Westinghouse is manufacturing the first unit for Reeves Station, to be constructed on the opposite side of the city and planned for service in the spring of 1959.

On the Indian reservations that surround Albuquerque, too, the demand for power is up. In traditional adobe huts, constructed of mud bricks baked in the sun, television is common. While some of these homes are hundreds of years old, many are beautifully modern, boast all-electric kitchens.

YOU CAN BE **SURE**... IF IT'S

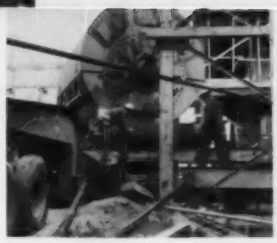
Westinghouse

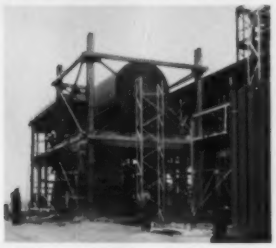
HEAT, WIND AND SAND...**WESTINGHOUSE** TURBINE GENERATORS

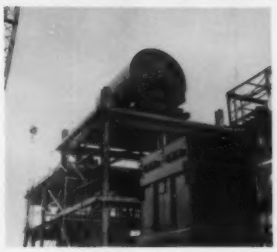
Out in the arid desert, where cloudless sunlit skies are the year-round rule, outdoor construction might seem ideal for a generating station. But the desert brings a problem all its own . . . sand. Sand and dust, whipped by winds off the nearby mountain range, almost defeat the economy offered by outdoor construction. Almost . . . but not quite.

Basically, Person Station follows outdoor principles. Boilers, gas-fired with oil as standby, are outdoor. The building itself houses pumps, condensers and most auxiliary equipment, with turbine-generators on the roof. To protect turbine-generators during open periods for inspection and maintenance, Person Station has weather resistant enclosures over the Turbine Generator Unit. With removable hatches for easy crane access, these enclosures can be pressurized to keep them free from the hazard of unpredictable dust storms while machines are open for work.

In the generators, Thermalastic®, the exclusive Westinghouse insulation, retains its elasticity and insulating qualities over the complete range of operating temperatures.







INGENUITY BOOSTS LIGHT WEIGHT GENERATOR INTO POSITION IN 15½ HOURS

Normal time for standard cribbing techniques to move a 30,000 kw generator on to the foundation, according to the Construction Superintendent of Stearns-Roger, (Consulting Engineers and constructors), could run as much as two weeks, dependent upon conditions.

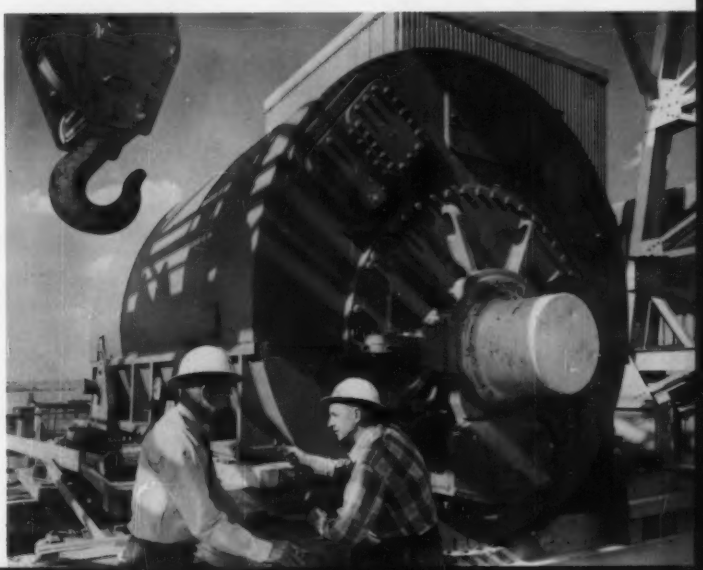
But here's how imaginative engineering shortened the job to just 15½ hours. When the 8:00 a. m. shift hooked on to Person Station's No. 4 generator last March 13, they moved it to a specially prepared elevating rig. By running it up the full reach of four jacks, then bolting it to the frame, reducing the jacks and bolting them up, reach by reach, the 95-ton generator was in position by 11:30 p.m., before a third-shift call was necessary.

PROVE THEY CAN TAKE IT

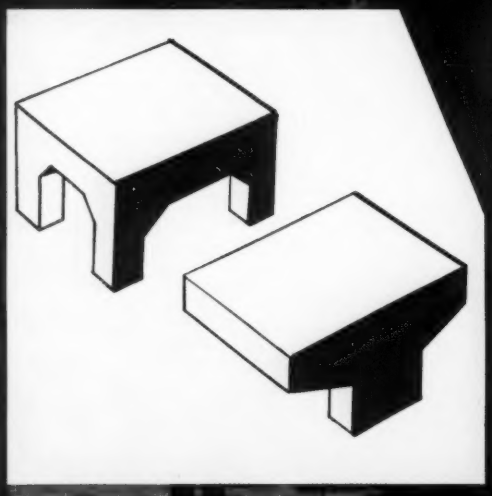
YOU CAN BE SURE...IF IT'S Westinghouse

Turbine-generator Unit No. 3 at Person Station is a Westinghouse 30,000 kw ASME-AIEE Preferred Design; Unit No. 4 will be a duplicate. Precise factory balancing of turbine and generator rotors —under actual operating speed and temperature conditions, minimizes field balancing, and speeds installation.

Max Niese, Mechanical Engineer, Public Service Company of New Mexico, is shown discussing the lifting technique with Brakey Wallace, Superintendent of Construction for Stearns-Roger. Helping substantially in setting the erection record was the fact that the generator for Unit No. 4 was received completely assembled, ready for placing on the foundation.



NEW FOUNDATION DESIGN CUTS COST OF TURBINE-GENERATOR INSTALLATION



First worked out by Stearns-Roger in collaboration with Howard Person, a totally new "T" foundation was developed for the turbine-generators in Person Station. Replacing the conventional four or six pedestals of most turbine foundations with two broadlegged "T's", these foundations offered substantial savings in forms as well as in the volume of reinforced concrete required. Having proved successful in the 20,000 kw units installed first, this type of foundation has now been applied to the 30,000 kw units. Lighter weight and vibration-free characteristics of Westinghouse turbine-generators made this arrangement feasible.

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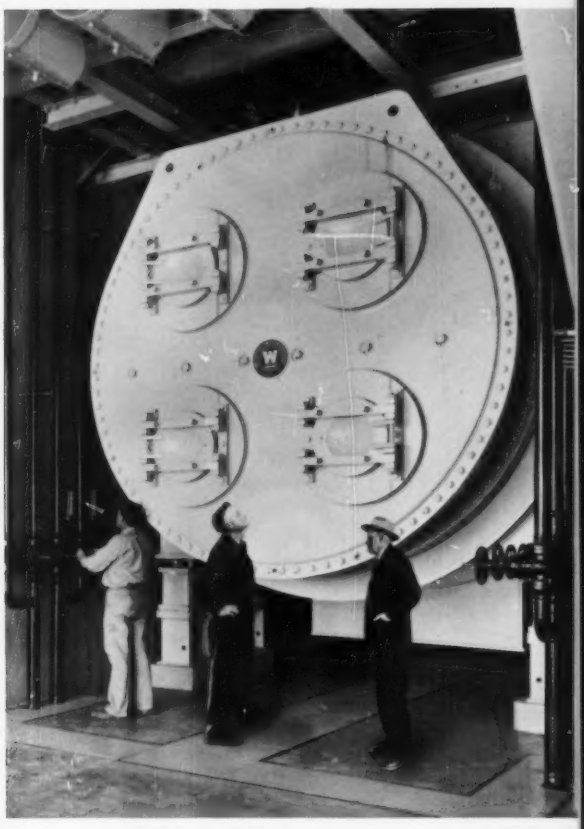
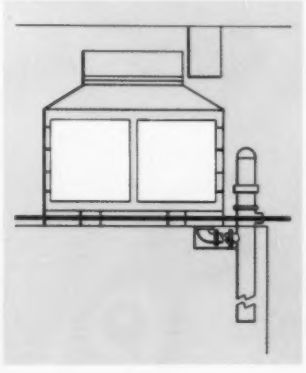
Westinghouse

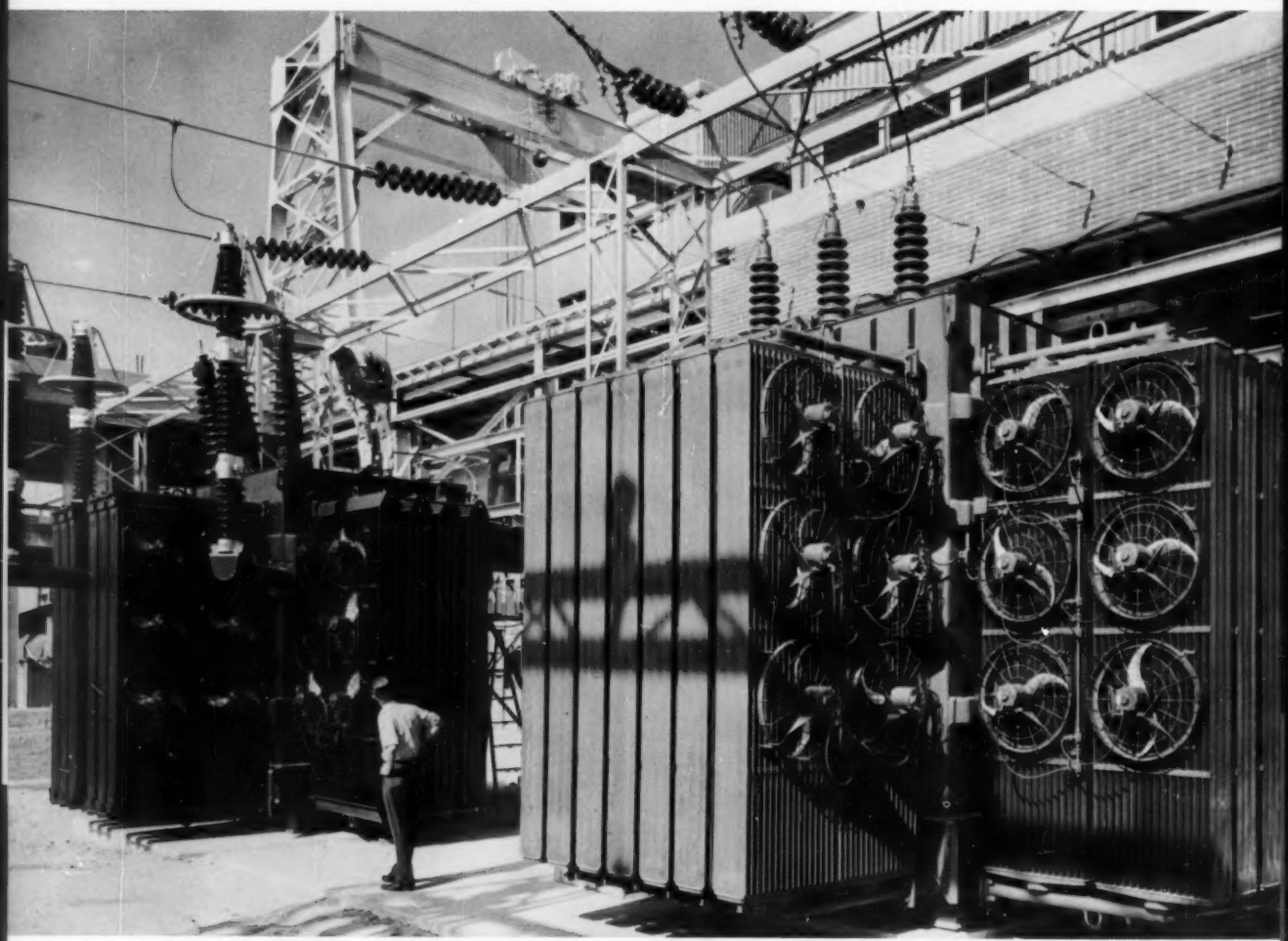


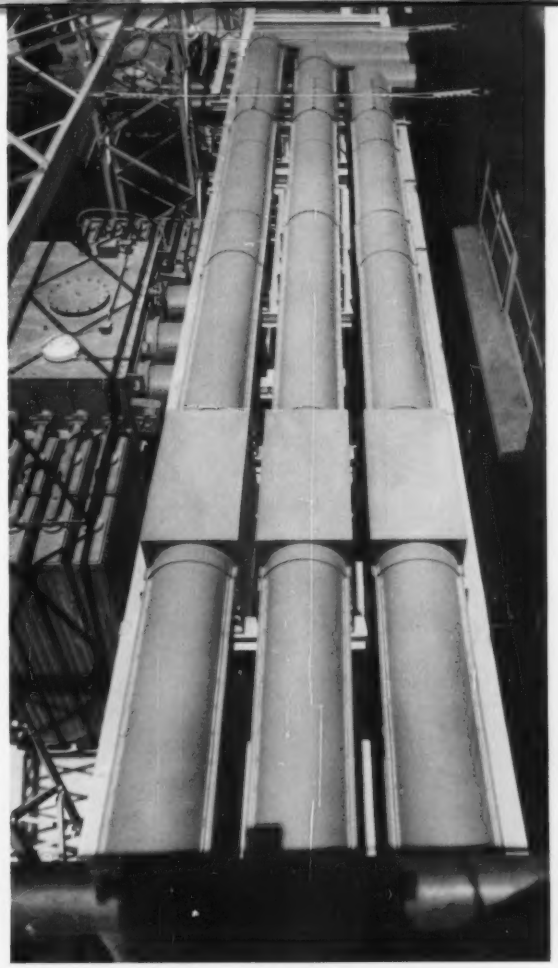
Garland Ratcliff (left) Westinghouse Erection Engineer assigned to the building of Person Station, checks over No. 3 condenser with H. H. Finch, Superintendent of Plants, Public Service Company of New Mexico. In the background, Marvin Branson takes a temperature reading on the hydrogen coolers. The condenser for Reeves Station, now under construction, will be of the newer Westinghouse rectangular design which offers a number of advantages for fast installation. In addition, with its two compartment radial-flow design and consequent short steam path to center air offtakes, the Westinghouse rectangular condenser provides lowest pressure drop.

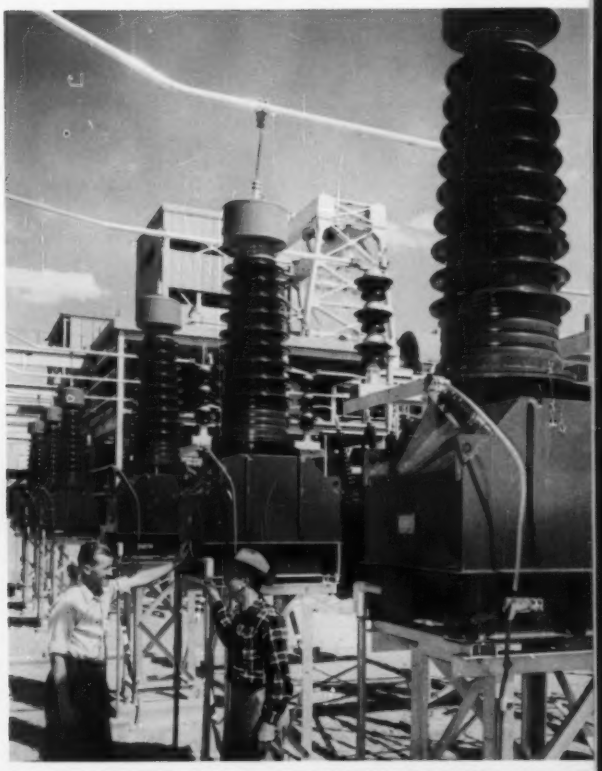


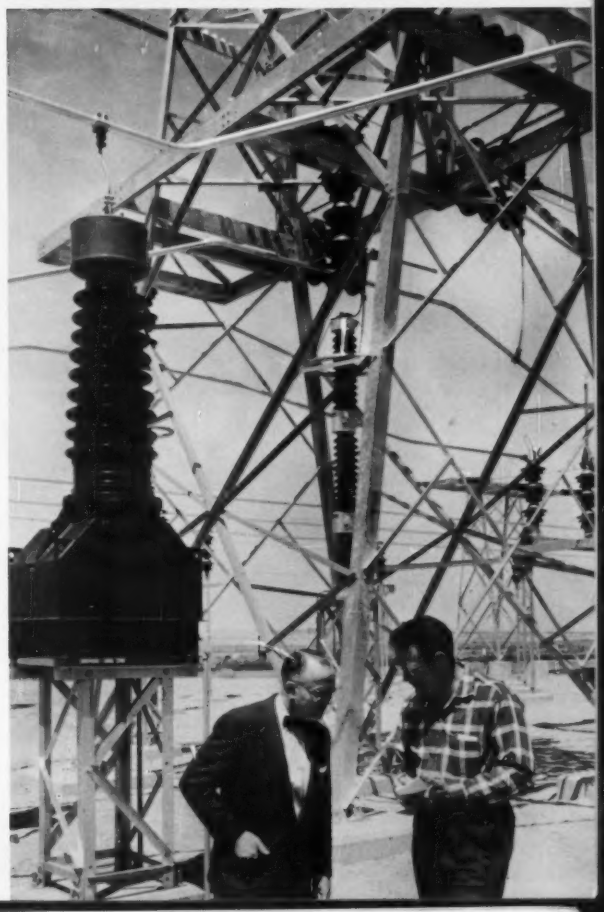
ALL WESTINGHOUSE SWITCHYARD...MAXIMUM PROTECTION FOR PERSON STATION 115 KV CIRCUITS

ALL FOUR POWER TRANSFORMERS at Person Station are Westinghouse Form-Fit® design. Transformers No. 1 and No. 2 are OA/FA, 25,000/33,333 and serving 43,800-volt transmission. Numbers 3 and 4 are OA/FA 33,000/44,000 kva to serve 115,000 volt transmission. They are protected with the new "condensed" Westinghouse arresters with the exclusive pressure relief device. Westinghouse Form-Fit transformer design not only offers appreciable savings in space and weight, but also the all-welded tank design is ideal protection in the battle with sand and dust.









FOR COMPLETE MECHANICAL AND ELECTRICAL PROTECTION, Westinghouse isolated phase bus was selected by Public Service Company of New Mexico to provide a safe, reliable connection between generators and transformers. The complete and individual metal enclosure of all conductors and supporting insulators provides the highest degree of mechanical and electrical protection, insuring complete safety to operating personnel—eliminating maintenance by the use of dust-tight construction.

JOHN HAYS, SUPERINTENDENT of Person Station (above, right) is shown in the switchyard with Guy Schell, Foreman of Electrical Maintenance, discussing the standard Westinghouse potential transformers for metering and relaying on the 115-kv transmission circuits. The "Coastal Finish" applied to these units is a distinct advantage, to withstand not only the blistering sun and grating sand, but also extremes of weather. Below, Walter Dolde, Chief Electrical Engineer, and Merrill Harkness, Senior Electrical Engineer, are shown with the Westinghouse SV station arresters in the background.

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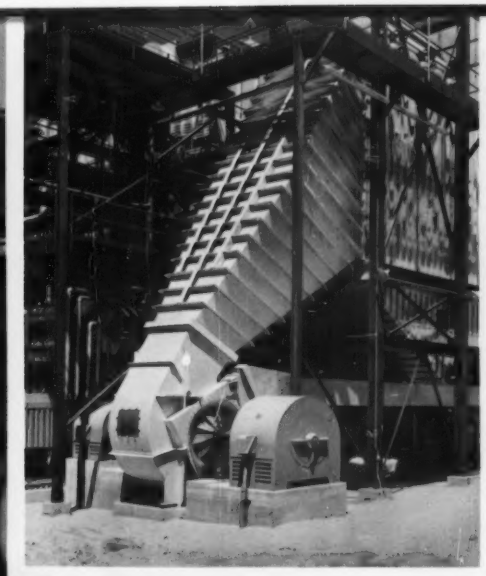
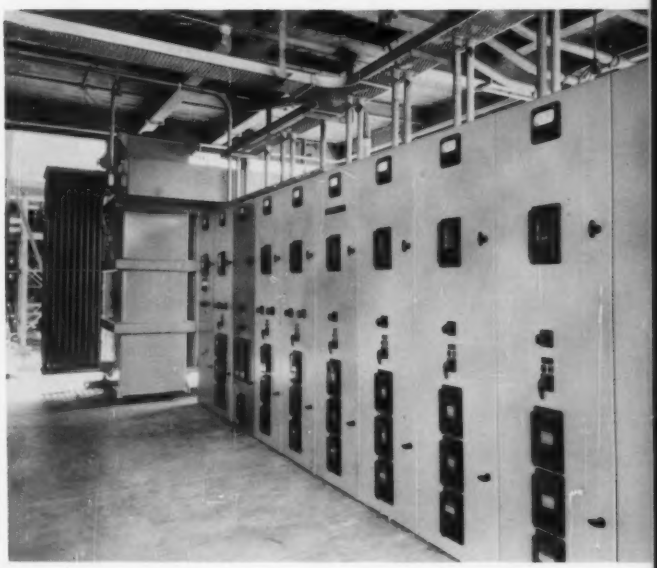
Westinghouse



(Top Left)
30,000 GALLONS OF WATER PER MINUTE are moved from cooling towers to condensers by two Westinghouse centrifugal circulating pumps. They are driven by Westinghouse Powerhouse Motors each rated 350 hp. In addition to the rigorous tests these motors undergo during manufacture to establish their reliability, all Westinghouse Powerhouse Motors are Thermalastic® insulated, for maximum protection in dust-laden atmosphere.

(Top Right)
ONLY FORCED DRAFT FANS ARE REQUIRED, since the boilers at Person Station are fired by gas under pressure. These are Sturtevant® Turbovane® Fans with the exclusive air-foil blade design which has up to 92% mechanical efficiency. These fans are driven by two Westinghouse Weather Protected Powerhouse Motors in tandem, rated 800 hp. and 350 hp.



(Above)
NO. 4 UNIT SUBSTATION . . . this bank of Westinghouse instruments and relays provides the intelligence and protection needed for efficient operation of the utility system. Recording instruments give permanent records of conditions on all lines served by this station. Directional overload protective relays quickly spot and isolate phase and ground faults . . . to provide maximum insurance against equipment damage. The transformer is Westinghouse Inerteen®, OA, 3-phase SL, 2500-kva.

DON POLLARD OF WESTINGHOUSE discusses the new Westinghouse Type GM-5-A power breakers with Guy Schell, Foreman of Electrical Maintenance at Person Station. Pollard is pointing out the advantages of the pneumatic mechanism, both mechanically and electrically trip-free, which gives high speed operation with low control energy. The reliability of this type of mechanism has been proven in over 15 years of field service.

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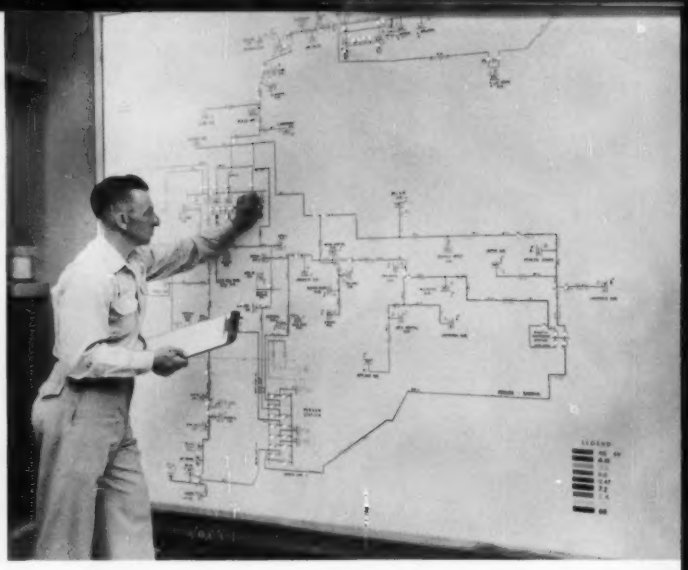
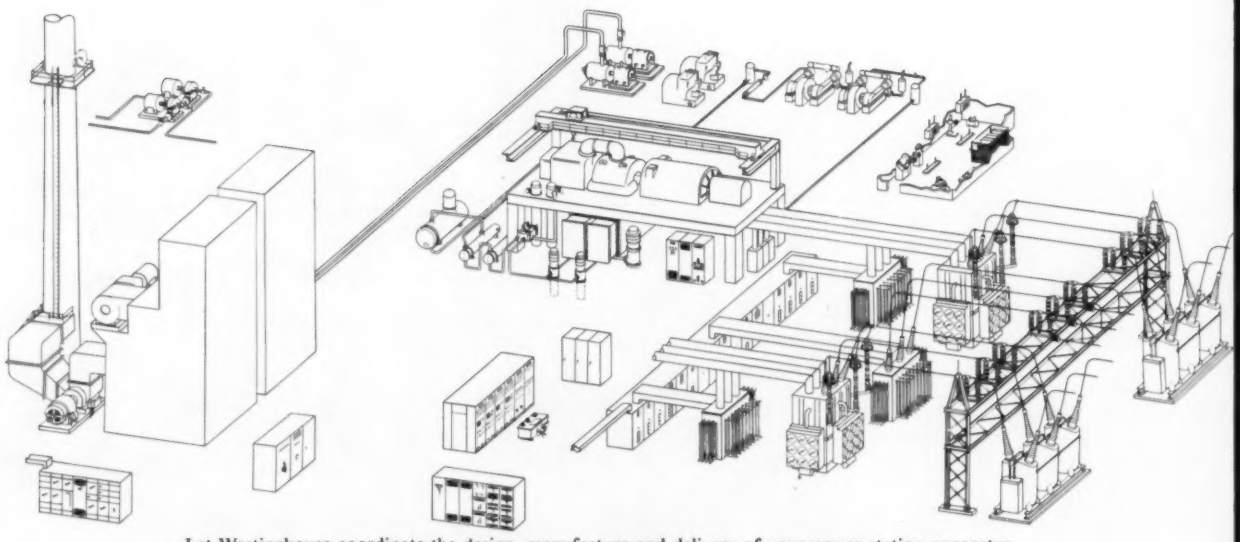
PERSON STATION... focal point of the Public Service system

The newest and most advanced station, Person Station houses the supervisory control for the entire system. Mervin Lattin, System Operator, is shown at the illuminated system diagram. Lights on this board are a constant reminder to the operator, showing position of all breakers and switches as well as operation of generators. No work crew moves onto any portion of the system without advising him what indication should be shown.



This is an account of how one utility met the challenge of progress and its load demands . . . and how Westinghouse cooperated with engineering, experience and equipment. Your Westinghouse representative can bring you similar assistance. The wide variety of coordinated equipment he is prepared to supply is diagrammed below. Call him for the most complete service available in the industry.

CP-1044



Let Westinghouse coordinate the design, manufacture and delivery of your power station apparatus.

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Catalogs-Bulletins

(*Continued from page* 138)

• **INSTRUMENTATION RECORDING:** Uses of magnetic tape recorders for recording scientific research and industrial process data are exemplified in Magnetic Tape Instrumentation issued by Ampex Corp, Redwood City, Calif.

• **CRANE-EXCAVATOR:** Application and engineering data on the company's seven and eight-ton machines, as well as on Model T-36 Crane-Excavator are listed in Bulletin TCR-202 of Schield Bantam Co, Waverly, Iowa.

• **WIRE:** A 72-page catalog describing its complete line of Wickwire is available from Colorado Fuel & Iron Corp, 575 Madison Ave, New York City, N. Y.

• **STEPDOWN TRANSFORMER:** Stock sizes, specifications and dimensions of stepdown transformers are listed in Acme Electric's catalog. Write the company at Cuba, N. Y. for "Stepdown Transformers."

• **WATER CHILLER:** Specification sheet for a packaged water chiller for residential, commercial, and industrial applications is available from Worthington Corp, Harrison, N. J., in Bulletin No. C-1100-S144 P.

• **COMPANY HISTORY:** A 12-page booklet CR-317-G illustrates the 50-yr history of International motor trucks produced by International Harvester Co, 180 N. Michigan Ave, Chicago 1, Ill.

• **MOTOR STARTERS AND CONTACTORS:** A-C's line of motor starters and contactors for 50 to 400 hp is covered in Bulletin 14B8615 published by Allis-Chalmers Mfg. Co, Milwaukee 1, Wis.

• **HEATING ELEMENT ALLOY:** Chromel-D, a nickel-chromium-iron heating alloy, for use up to 1800F is described in catalog M-55D printed by Hoskins Mfg Co, 44445 Lawton Ave, Detroit 8, Mich.

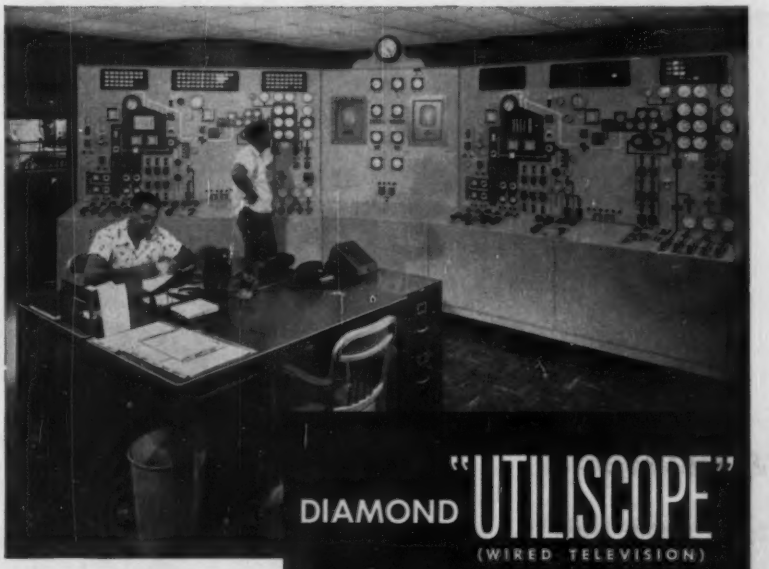
• **TRANSFORMER MOUNTS:** Hub-Mounts designed to hold three 1,500-lb transformers on wood poles 6.5 in. to 16 in. diameter are illustrated in a leaflet distributed by Hubbard & Co, Pittsburgh 1, Pa.

• **MISCELLANEOUS:** The following publications have been recently released by General Electric Co. They may be obtained by writing the company, Schenectady 5, N. Y.

Tubular heater applications and their case histories are discussed in bulletin GEA-5866.

Standard-design transformers — Economical advantages in using RM medium transformers are detailed in bulletin GEA-6617.

AUTOMATION IN POWER PLANTS



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The operator in the above photograph is watching the ITV image of the water level in two boilers . . . transmitted by "Utiliscope" cameras focused on Diamond Bi-Color water gauges. The water levels are easily and unmistakably read on the viewing screens. There can be no error . . . the level is shown correctly or there is no picture.

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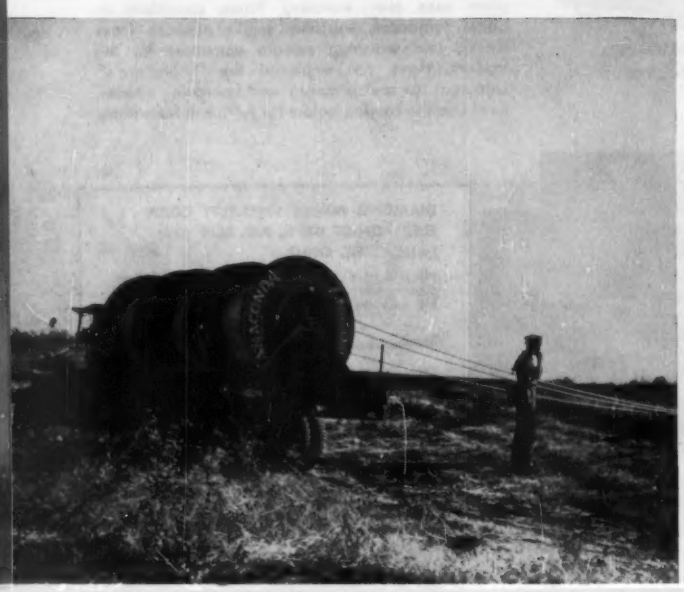

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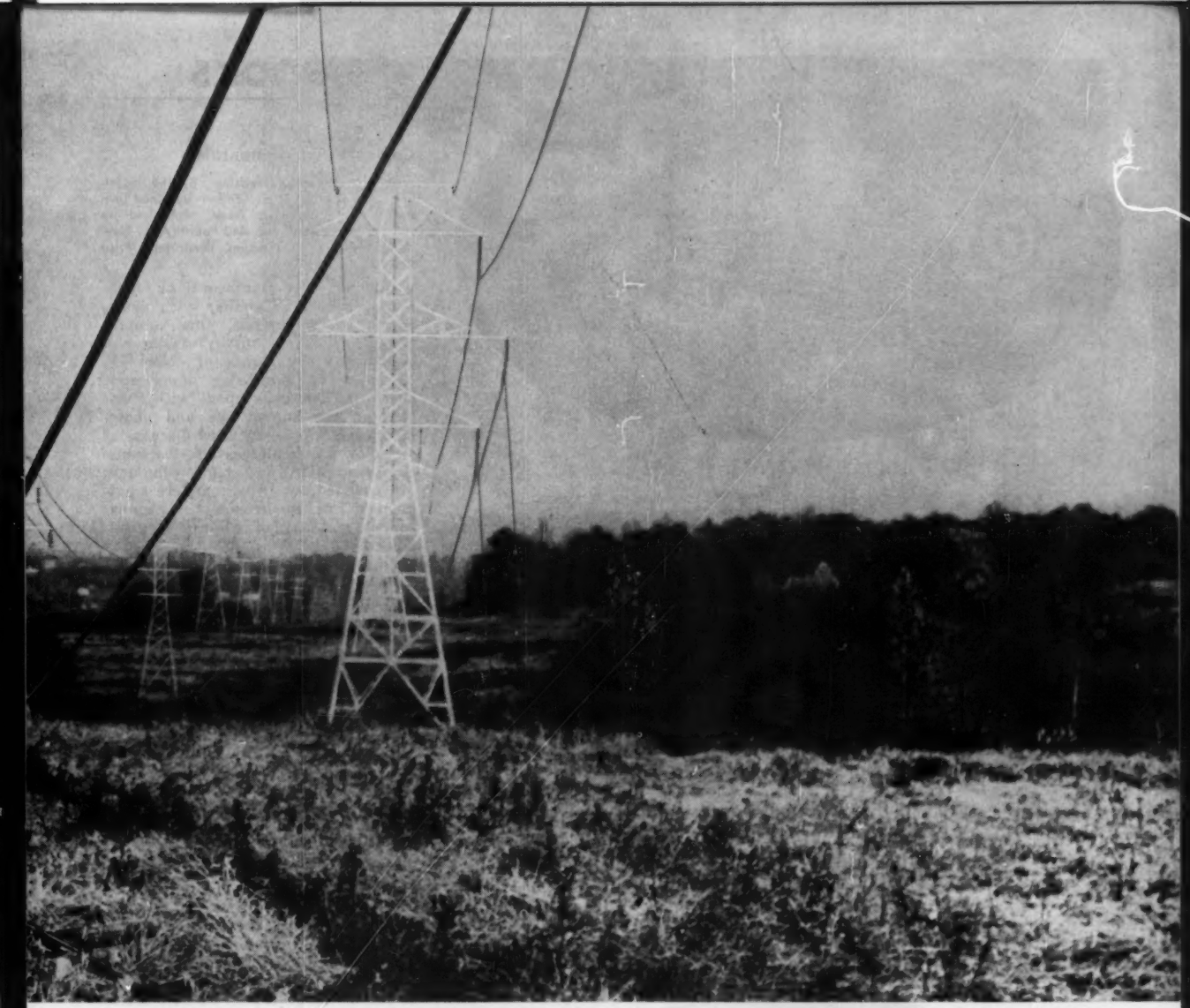

230KV Riverbend-Tiger Line. Here, you look west of Kings Mountain, S. C.

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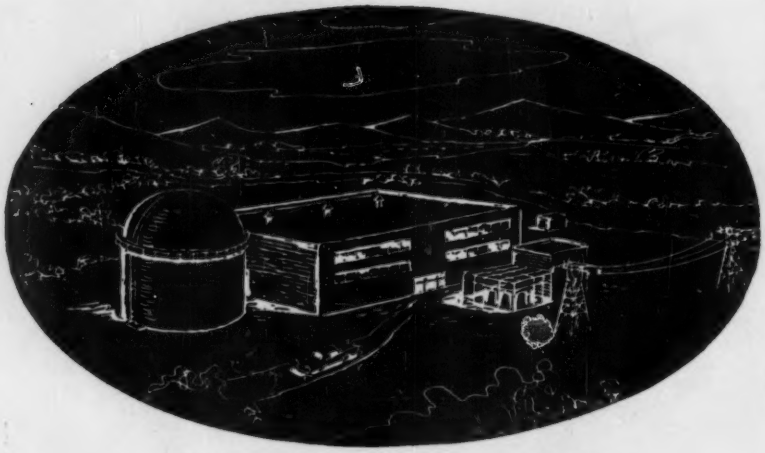

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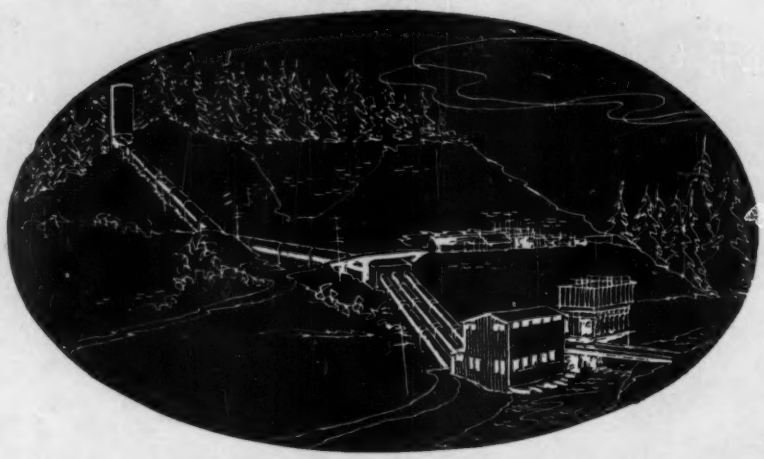

ATOMIC, HYDRO and FOSSIL FUEL POWER PLANT DESIGN
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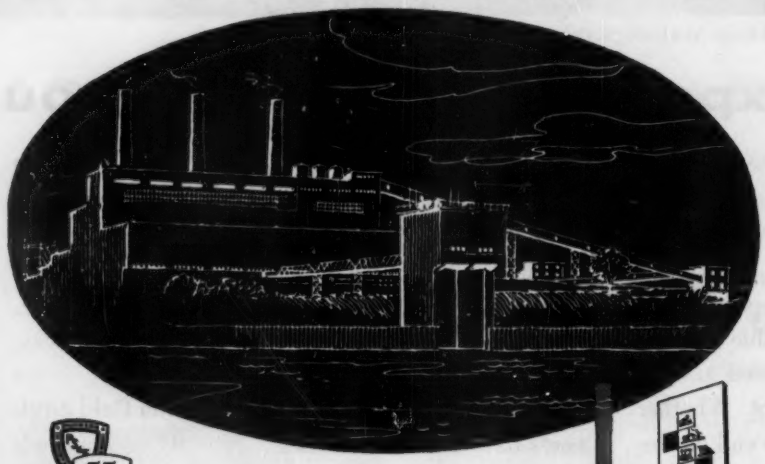

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BOOKS

Color TV Fundamentals

Principles of Color Television. By the Hazeltine Laboratories Staff. Edited by Knox McIlwain and Charles E. Dean. Published by John Wiley & Sons, Inc, 440 Fourth Ave., New York, 16, N. Y. 562 pages, illustrated. Price $13.00

Intended for engineers or technicians who are familiar with monochrome fundamentals, this comprehensive book is a survey of the supplementary techniques of color TV. Little or no knowledge of color is assumed. The book opens with chapters on the human eye and photometric principles. Detailed discussions on color TV fundamentals, transmission, reception and test techniques are rounded out by a complete treatment of FCC requirements and an excellent glossary of color TV terminology.

Mathematical developments require a working knowledge of elementary calculus. Early chapters on light and photometry may have some value in training lighting specialists and salesmen. But the major value of this work will be for those with hobbies in TV.

AC Circuits Explained

Electrical Engineering Circuits. By H. H. Skilling Published by John Wiley & Sons, Inc, 440 Fourth Ave., New York 16, N. Y. 724 pages, illustrated. Price $8.75

This is intended as a textbook for use in a college course in a-c circuits. The author gives the subject matter thorough coverage and presents material not only on the traditional topics of a-c circuits but also on some of the newer concepts. Fourier series and the Laplace Transformation are treated in enough detail to be of real practical use.

Complex and matrix algebra, determinants, and simple calculus are the required mathematical tools. The book is well illustrated and contains the true mark of a textbook—lots of problems.

Semiconductors Explained

An Introduction to Semiconductors. By W. C. Dunlap, Jr. Published by John Wiley & Sons, Inc., 410 Fourth Ave., New York 16, N. Y. 417 pages, illustrated. Price $11.75

This book offers a complete coverage of the subject starting with the fundamental physical principles and carrying on straight through to the applications of this device. The author presents the elementary theory in a rigorous mathematical manner. But

(*Continued on page* 158)

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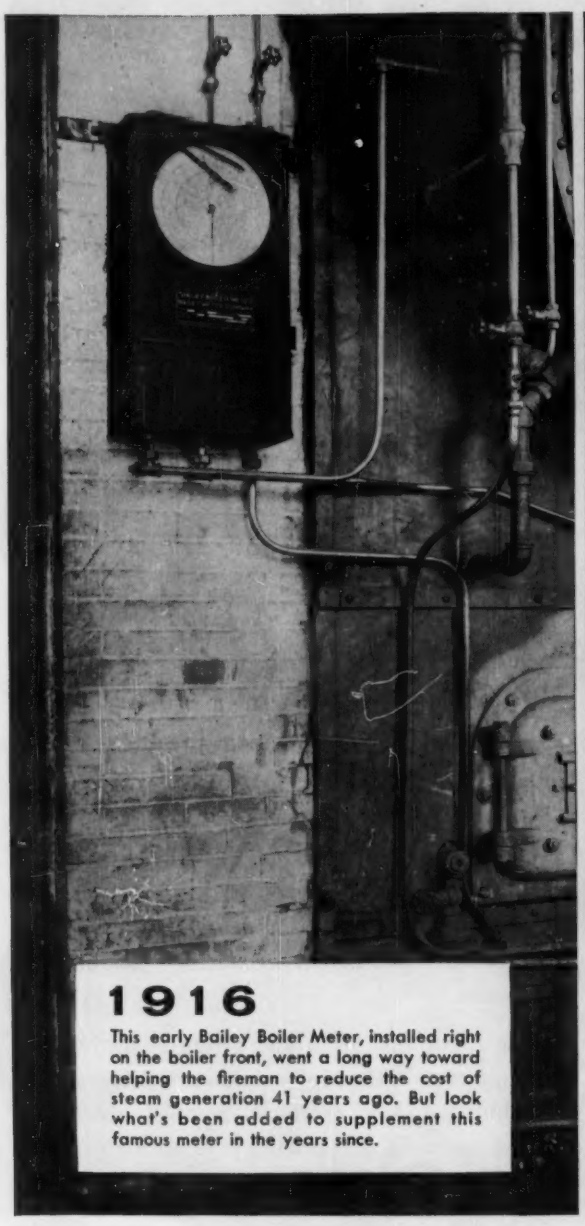
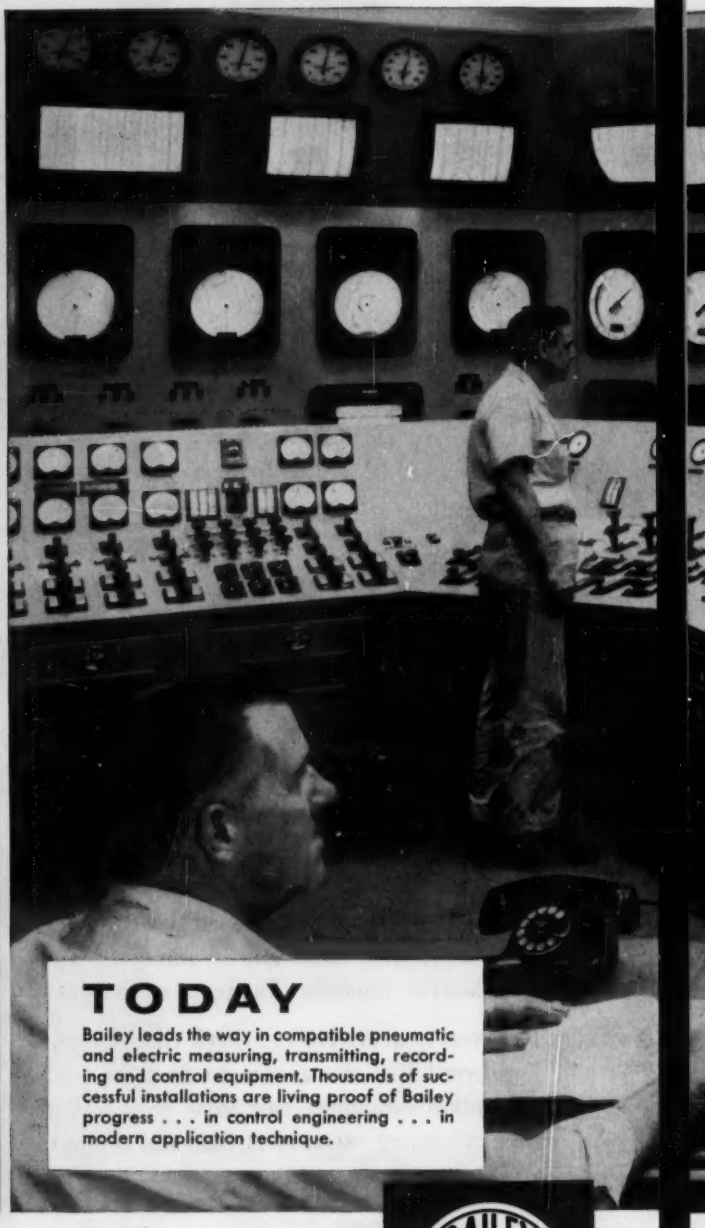


1916

This early Bailey Boiler Meter, installed right on the boiler front, went a long way toward helping the fireman to reduce the cost of steam generation 41 years ago. But look what's been added to supplement this famous meter in the years since.



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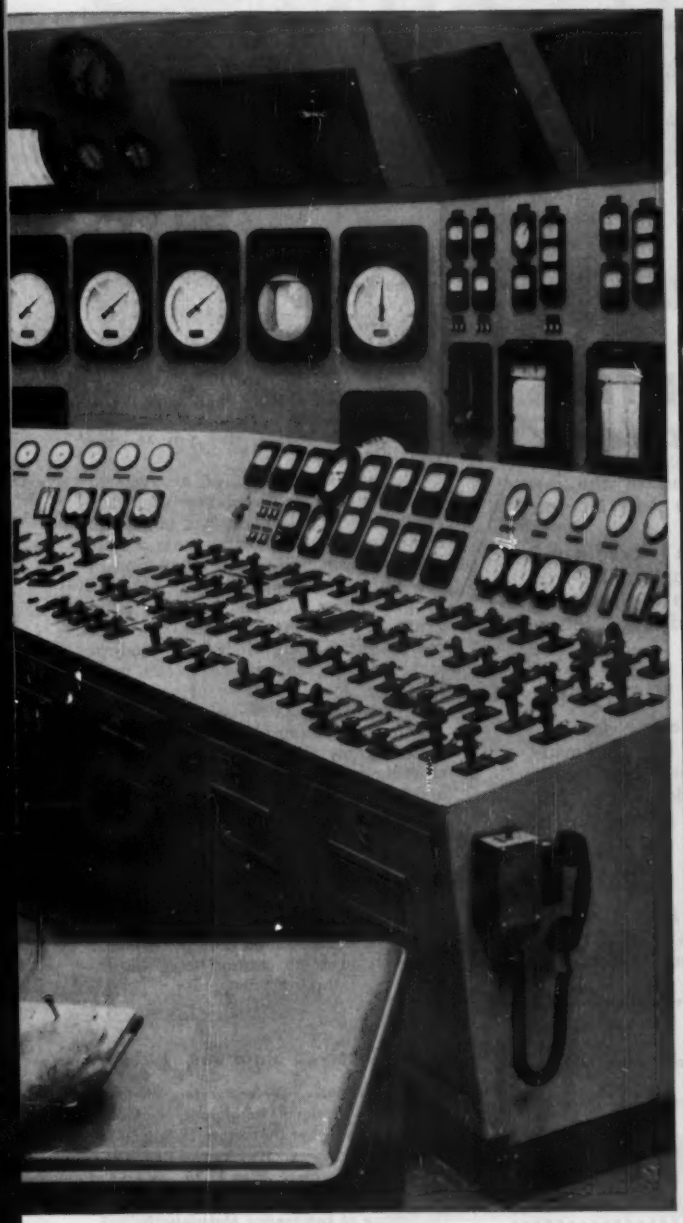

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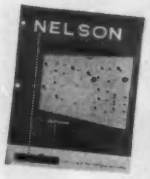

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Books

(*Continued from page* 154)

the text is quite lucid and the use of higher mathematics should not deter the reader interested in this relatively new field.

The approach of the book is almost entirely physical, and even the sections on devices emphasize the mechanisms and mode of operation of the devices. The book is well illustrated particularly the chapters dealing with crystal structure.

Chapters in the book cover the following topics: Solid state theory, crystal structure, statistical mechanics and electron theory for metals and semiconductors, and properties and uses of semiconductors.

The book is an excellent introduction to semiconductors because it is exacting and yet lucid, and above all because it is complete in its treatment of the subject.

Computer Programming Primer

Digital Computer Programming. By D. D. McCracken. Published by John Wiley & Sons, Inc, 440 Fourth Avenue, New York 16, New York. 218 pages. Price $7.75.

Through the device of a mythical computer, which combines elements from several existing types of digital computers, the author presents a simple, clear, but practical introduction to the important function of computer programming. Anyone with a good grasp of basic mathematics, yet with limited or no knowledge of modern stored program computers, can gain from the book the basic principles of programming.

Numerous examples throughout illustrate how the program is derived, starting with very simple instructions and proceeding to the more complex. Exercises at the end of each chapter will allow the more interested reader to gain proficiency in programming techniques. These examples and exercises approach the equivalent of having an actual computer to work with, except of course, that the actual solution to a problem cannot be obtained.

Books Received Since July 1, 1957

Experimental Boiling Water Reactor. Prepared by Argonne National Laboratory. Published by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 233 pages, illustrated. Price $2.25.

The Science of Engineering Materials. By J. E. Goldman. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 510 pages, illustrated. Price $12.00.

Standard Handbook for Electrical Engineers. Edited by A. E. Knowlton. Published by McGraw-Hill Book Co, 330 West 42nd Street New York 36, N. Y. 2,311 pages, illustrated. Price $19.50.

in the long run... it's O.Z.

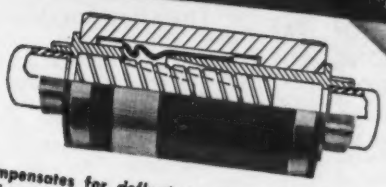
Type AX

Provides 4" expansion, contraction movement. Malleable iron head, body Hot Dip Galvanized. Weathertight head sealed by factory-installed high grade graphite packing. Insulating conduit end bushing eliminates cable abrasion. 10 sizes for conduit ½" to 4" diameters.

Type EX

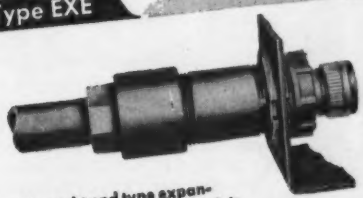
Permits 8" conduit movement. Optional length sleeves, additional cost. Weathertight head sealed by factory-installed high grade graphite packing. Insulating bushings prevent cable abrasion. Hot Dip Galvanized finish. 13 sizes for ½" to 6" conduit diameters.

Type EXDS



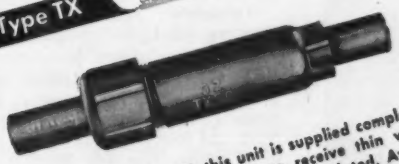
Compensates for deflection, expansion, contraction. ¾" movement all directions from normal; 30° angular movement. Also used as vibration damper between conduit sections. 10 sizes.

Type EXE



Weathertight end type expansion fitting. Designed for conduit terminating in junction box, where expansion, contraction take place. Supplied complete: locknuts, bushings. Standard finish, Hot Dip Galvanized. 13 sizes.

Type TX



Similar to the Type AX, this unit is supplied complete with extension nipples, ready to receive thin wall couplings. Standard finish is cadmium plated. Available in 6 sizes for conduit ranging from ½" to 2".

for the longer line of EXPANSION FITTINGS

In the long run, no line of conduit is more dependable than its components. When it comes to dependability in expansion fittings, look to O. Z. as the line that measures up! Five basic types provide the dependable answer to your fitting problems in conduit expansion, contraction, and deflection. O. Z. is the dependable line because it's the dependable line with the *right size*, the *right type*, for every requirement!

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
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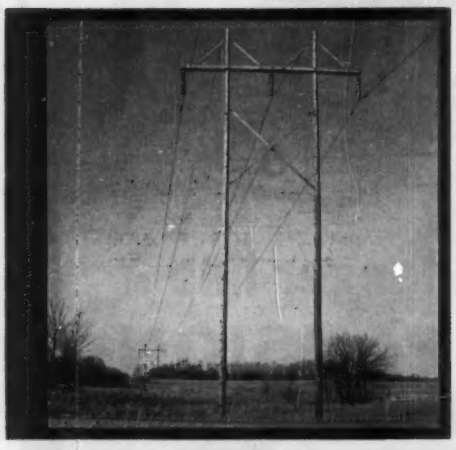
GALVANIZED STEEL STRAND

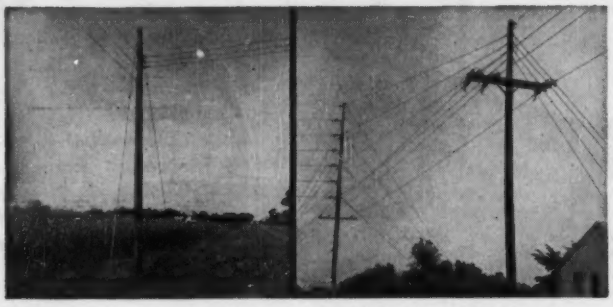


YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

For OVERHEAD GROUND WIRE . . .
CRAPO Weldless Galvanized Steel Strand



The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .
Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

Contact your jobber or write for descriptive folder.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

TECHNICAL LITERATURE

FILLER METAL COMPARISON CHARTS—A 24-page booklet contains a comprehensive set of welding rod and electrode comparison charts. Included are the brand names of 61 companies, 12 AWS-ASTM specifications, and charts having classifications of brand names, producers, and distributors. Copies can be obtained for $2.00 from American Welding Society, 33 W. 39th Street, New York 18, N. Y.

CABLE JACKETING — Developments in compounds for cable jacketing for non-migratory cable jackets and primary insulations in vinyl chloride materials are described in Kabelitems J-582. Write Bakelite Co, Division of Union Carbide Corp, 30 E. 42nd Street, New York 17, N. Y.

DIFFERENTIAL TRANSFORMERS—Theory and advanced applications are shown in this 32-page booklet. Characteristics of various differential transformers are tabulated and charted with basic circuits diagrammed. Handbook of Linear Transducers is available at $2.00 from Automatic Timing & Controls, Inc, King of Prussia, Pa.

NEMA STANDARDS PUBLICATIONS—The following standards publications have been issued by National Electrical Manufacturers Association, 155 E. 44th Street, New York 17, N. Y., at the prices listed:

Alternating-current Electrolytic Capacitors for Motor Starting, CP 6-1957, 20 cents.

Direct-current Fixed Paper Dielectric Capacitors for General Industrial Applications, CP 7-1957, 40 cents.

Fixed Paper Dielectric Capacitors for General-Purpose Alternating-current Applications, CP 5-1957, 35 cents.

Series Capacitors, CP 2-1957, 35 cents.

Laminated Thermosetting Decorative Sheets, LP 2-1957, $1.75.

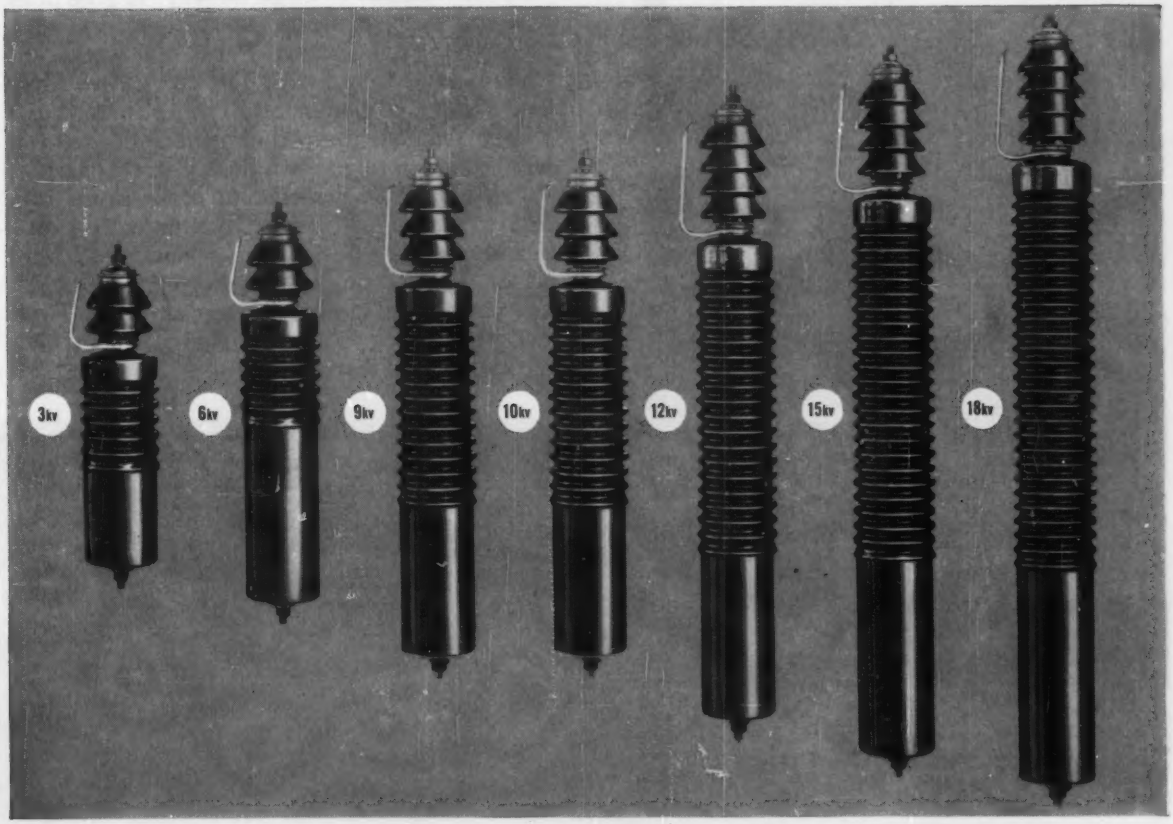
Silicone Elastomer (Rubber) Coated Glass Fabric, VF 8-1957, 75 cents.

Varnished Tubing and Saturated Sleeving, VS 1-1957, 50 cents.

PAINTING STRUCTURAL STEEL—Different painting systems including primers, touch-up and field coats for three and four coat systems are presented in "Painting Highway Structural Steel." This booklet which also contains formulas that meet the specifications of American Association of State Highway Officials can be obtained free from Lead Industries Association, 60 E. 42nd Street, New York 17, N. Y.

FLAMMABLE LIQUIDS — National Fire Protection Association has compiled an index as a guide to storage and use of flammable liquids. The 120-page booklet uses flash points of liquids as indications of their relative flammability. Index which contains 3,600 products is printed by NFPA, 60 Batterymarch Street, Boston 10, Mass. Price is $1.50.

You get positive protection from line lockouts with these external-gap CRYSTAL VALVE arresters



The famous distribution-type Crystal Valve lightning arrester, containing the exclusive Oxidized-Grain "Crystallite" Valve element, is available in all seven ratings shown above. It represents a half century of experience in developing and producing the finest in lightning protection.

The external gap on the Crystal Valve arrester offers positive protection from line lockouts. The Oxidized-Grain "Crystallite" Valve element, an exclusive feature of Crystal Valve arresters, provides lower unit internal impedance, higher arc-suppressive ability, and increased thermal or surge-current-carrying capacity than ordinary valve elements.

Service records covering thousands of installations show that Crystal Valve external-gap arresters rate better than 99% perfect. To assure virtual elimination of power failures or costly transformer damage due to lightning, specify external-gap Crystal Valve arresters for your power line equipment.

Crystal Valve arresters are available for either cross-arm or tank mounting. For additional information, write Electric Service Works, Delta-Star Electric Division, H. K. Porter Company, Inc., 17th and Cambria Sts., Philadelphia 32, Pa.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

ELECTRIC SERVICE WORKS

Divisions of H. K. Porter Company, Inc.: Cleveland, Connors Steel, Delta-Star Electric, Henry Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings, and H. K. Porter Company (Canada) Ltd.

To build load in its area . . .

Patchogue Electric Light Company

Willoughby Oxley, Manager of Operations, studies a pressure-creosoted pole.

"Pressure-creosoted poles are the best value money can buy,"

says Manager of Operations

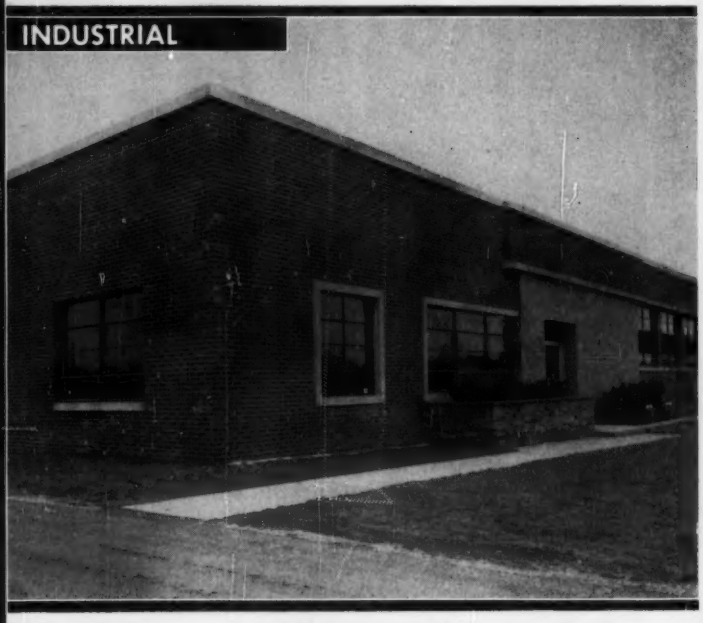
"We first used pressure-creosoted poles in 1924," states Mr. Oxley, Manager of Operations, "and we have purchased nothing else since 1935. Pressure-creosoted poles have proved to be durable and insect-resistant. They have a life expectancy in excess of any kind of pole we could obtain.

"The element I like most is that once a pressure-creosoted pole is in the ground, we just don't bother with it any longer. We know there will be a minimum of trouble. And this is where pressure-creosoted poles pay off—through lower maintenance."

The Patchogue Electric Light Company, Patchogue, Long Island, New York, does not wait for business to come its way. It goes after business. Mr. Ira Rogers, Jr., Manager of Area Development, tells how: Pelco works with the Chambers of Commerce, The New York State Department of Commerce, Town, County, and Village Officials and other civic groups interested in attracting new industry to this area.

Pelco advertises, sends out promotional brochures, maintains contact with industrial realtors and factory-placement agencies and makes personal calls on industrial prospects. Information concerning available plant sites, the labor market, housing, transportation facilities, etc., is compiled for distribution.

INDUSTRIAL

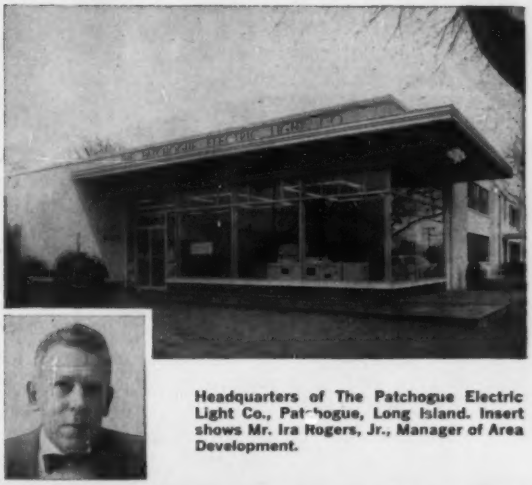


If you would like more information on pressure-creosoted utility poles, and the way they can enable you to save money and establish better service for your utility, just get in touch with the nearest Chemical Sales Office of United States Steel or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

has a many-sided development program

The residential aspect of Peico's Area-Development activities includes cooperative advertising and promotion of model homes. Home Service personnel work with builders, home owners and appliance dealers in kitchen and laundry planning, lighting layouts and also demonstrate the proper use of electric equipment so the customer can get the most out of this service.

Judging by the progress of The Patchogue Electric Light Company, this intensive area-development program is paying off. In 1950, the company had 14,836 customers and net sales of 33,042,109 KWH. In 1956, there were 21,841 customers and net sales had increased to 73,815,149 KWH.



Headquarters of The Patchogue Electric Light Co., Patchogue, Long Island. Insert shows Mr. Ira Rogers, Jr., Manager of Area Development.

CREOSOTE'S PAST ASSURES WOOD'S FUTURE

USS CREOSOTE

Sales Offices in PITTSBURGH, NEW YORK, CHICAGO, CLEVELAND, SALT LAKE CITY, AND FAIRFIELD, ALABAMA

UNITED STATES STEEL

Roebling Uses Vertical Vulcanizer for Cable

A vertical continuous vulcanizer was installed recently at Electrical Wire Division of John A. Roebling's Sons Corp, Trenton, N. J.

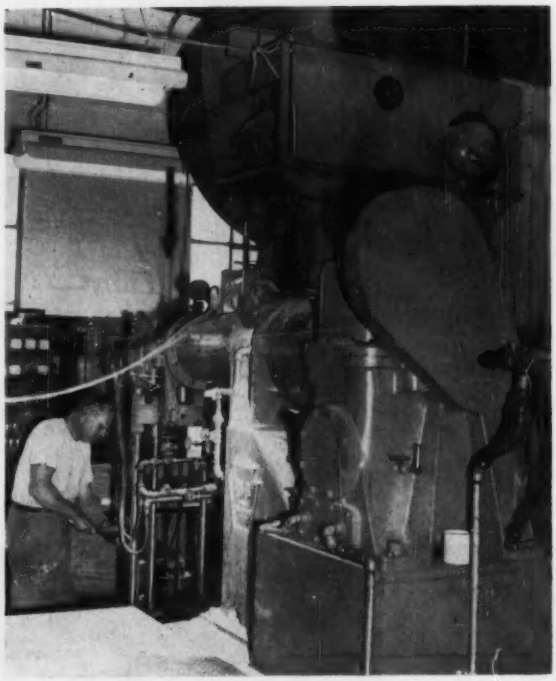
This vulcanizer installation is an evolutionary step in manufacturing methods of high-voltage, rubber-insulated power cable.

In the picture, an arrow indicates the downward travel of cable from an overhead sheave through the vertical vulcanizer (shown) to a reel on the floor below. Employee is inspecting end of finished cable as it leaves the vulcanizer.

Extruding the putty-like butyl insulations has been made easier because extrusion is now made vertically downward instead of in the conventional horizontal direction.

This advance is reported to permit extrusion of insulations, and vulcanization without scoring, flattening, or deformation.

With the vertical continuous vulcanizer, concentricity and more uniform diameters are maintained. Now longer cable lengths are possible. Recently a lot of 500-Mcm cable insulated with 27/64-in. Roecozone B (butyl base synthetic rubber ozone resisting insulating compound) was run in 2,000-ft lengths. With use of extra-large reels, it is now possible to run large size cables in lengths up to 3,000 ft.



Reynolds Metals Co Develops New Aluminum Overhead Power Conductor

A new conductor for overhead power lines made of 5005 aluminum alloy will be announced this month by Reynolds Metals Co. This new conductor was developed in response to demands by electric utilities for a high-strength, all-aluminum conductor comparing economically with ACSR.

These Were Required

Requirements established by Reynolds for the development of this strong aluminum alloy were these:

1. It must have substantially higher tensile strength than EC aluminum so that cables made of it may be strung with less sag.

2. Conductance of a seven-strand cable of the alloy must be the same as conventional 6/1 ACSR of the same physical size. This would let available accessories and connectors designed for ACSR fit the electrically equivalent strong alloy cable.

3. It must be non-heat-treated so that wires may be produced in the same manner and on the same equipment as EC.

4. Manufacturing costs must be low enough so that cable made of it might have selling prices per 1,000 ft no greater than those of electrically equivalent sizes of 6/1 ACSR.

5005 Alloy Selected

The 5005 alloy enabled Reynolds to meet all the above requirements. It is a standard commercial alloy used for other wrought products for many years. But, much research was needed to establish properties of wire products made from it and to develop commercial wire fabricating practices.

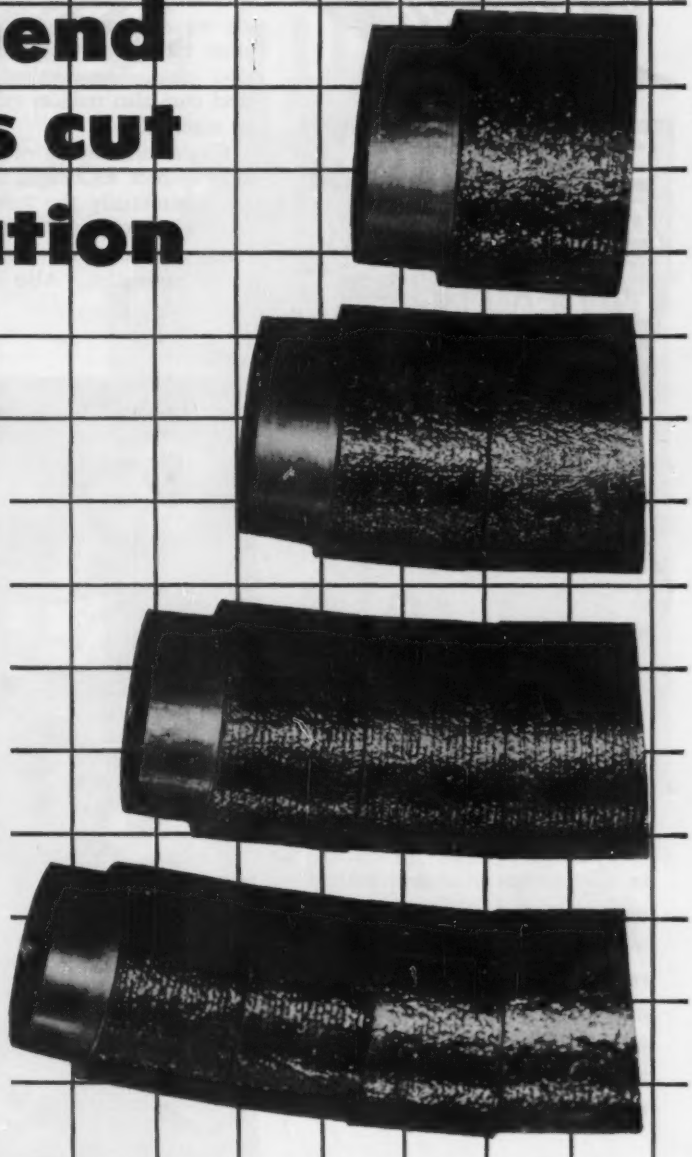
Tensile strength of 5005 wires ranges from 32,000 to 37,500 psi depending on diameter. This is 35% to 40% greater than strengths of EC wire. Such 5005 cables have sufficient strength to provide substantially less sag than all-EC cables, and approximately the same sag as ACSR in many situations.

ACSR Accessories Suitable

While designed to have the same dc resistance as other standard size cables, 5005 has a higher current carrying capacity. Techniques for using all types of accessories with 5005 alloy cables are the same as with all-EC cables. Generally accessories intended for use with 6/1 ACSR are suitable for the same size 5005 cables.

In Reynolds' laboratory tests, compression sleeves designed for the aluminum portion of ACSR have

These bend sections cut installation costs



Orangeburg 5° Bend Sections are the "on-the-job" answer to special bend problems. They get over, under or around those unforeseen obstructions . . . and do it easily and economically.

Crossovers . . . transformations . . . offsets . . . can be made in the field by joining sections together to obtain the desired direction change. No costly delays . . . no special bends needed.

Orangeburg 5° Bend Sections* are another reason why Orangeburg Fibre Conduit is the ideal protective raceway for underground electrical cables.

Distributed by Graybar Electric Company and General Electric Supply Company. Branches and stocks in principal cities.

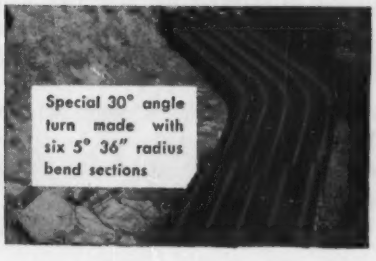
Write Dept. EW-97 for Bulletin S.E.C.

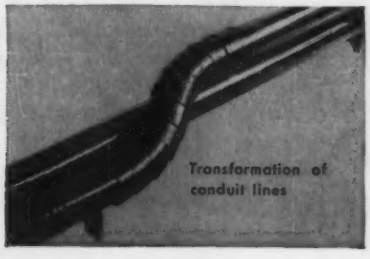
**Made for Orangeburg Standard Conduit only.*

ORANGEBURG MANUFACTURING CO., INC.
Orangeburg, N. Y. Newark, Calif.

ORANGEBURG®

FIBRE CONDUIT PROLONGS CABLE LIFE



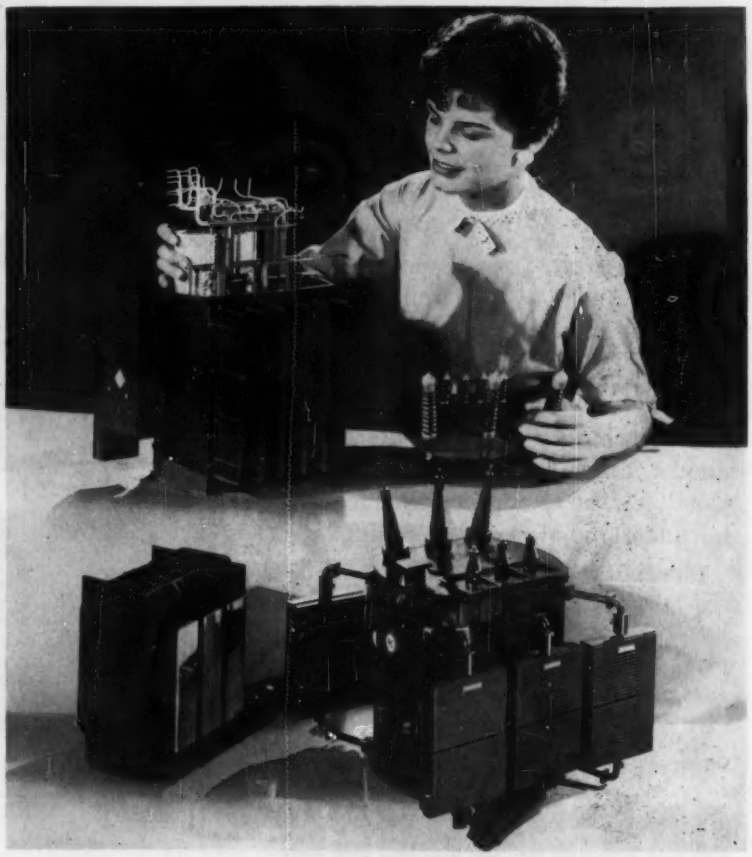


withstood in excess of 95% of the rated strength for all sizes of 5005 cables up to 247,570 CM (4/0 EC equivalent. Splicing and dead-end ing are simplified because no separate fittings are required for the steel core. The elimination of the steel core also reduces cable weight by about 20%.

Characteristics of 5005 wires with respect to fatigue and creep are substantially the same for EC wires when subjected to stresses representing the same percentage of actual strengths. Also laboratory tests showed that the effect on tensile strength of long term exposure to temperatures of 100C is about the same on 5005 as on EC.

It is anticipated that 5005 cables can be extended to larger sizes without any limitations that would not also apply to other materials. It is also extremely attractive for the bare neutral messenger of self-supporting secondary and service drop cables.

These and several other types of 5005 alloy cables are being developed.



Models Used To Sell Transformers

Scale models have solved the problem of showing the design of large Allis-Chalmers transformers. The models illustrate construction features used during manufacture to prospective purchasers who can examine them on a desk or table.

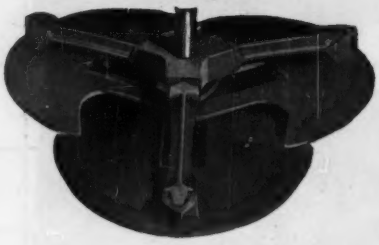
Above is demonstrated how the models can be taken apart to show different stages of construction. The core form transformer being disassembled includes an inert gas system, uni-directional breather, tank, relief diaphram, and load tap changer.

(*More M & M on page* 168)

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
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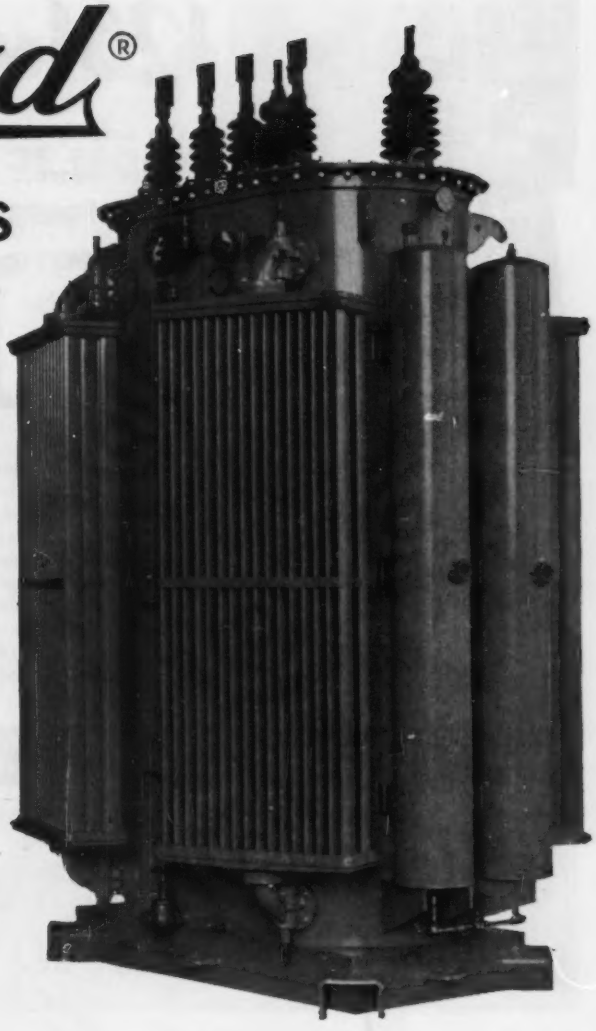
Standard®

POWER TRANSFORMERS

efficient . . .
economical . . .
dependable



2500 KVA, single-phase, OISC power transformer, 34,500 volts primary, 2400x4800 volts secondary. Special design to meet customer's specifications. Standard engineers will work with you to meet your requirements.

● Where power requirements demand above-average reliability and efficiency, Standard Power Transformers are your one best choice. Figures taken from service records show how Standard's sound engineering principles cut maintenance costs to the bone and boost transformer life.

Standard engineers work with your engineers to incorporate the transformer design features and specific components that meet your needs most efficiently. Bushings, tanks, finishes, covers, and accessories meet ASA specifications and are rigidly inspected by Standard. Each transformer, regardless of size, is subjected to all standard commercial tests—both during and after manufacture.

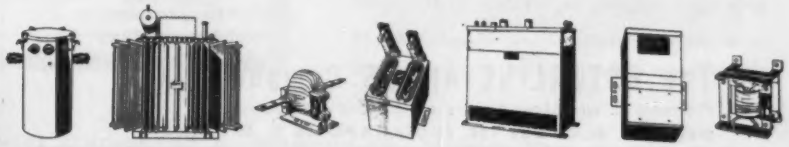
We can build transformers to your specifications as quickly and economically as if you'd bought repetitive designs.

There's a Standard Transformer representative near you. Call him. He'll work with you to produce the best transformers you've ever used.

Standard®
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES

Transformers
FOR EVERY APPLICATION



1261 ways

to simplify cable splices and terminations . . . with kits and fittings from

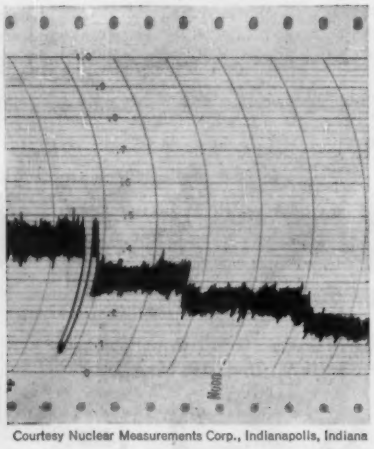
PLM

PLM Splicing and Terminating Kits eliminate need for time-consuming planning and ordering . . . provide everything needed, in one package, for correctly designed splice or termination.

● Here's new, fast help in figuring and ordering cable splicing and terminating needs! This new, 52-page PLM Catalog 301 lists and illustrates PLM unit package kits and fittings in hundreds of standard sizes and ratings, through 23 kv . . . simplifies ordering and specifying special requirements. Whether your needs are for standard or special armored cable fittings . . . 2, 3 or 4-way splices in or to armored cable, non-metallic sheathed cable or lead-covered cable, you'll find answers, fast, in PLM products. Write for PLM Catalog 301 today, or ask for quotations.

PLM PRODUCTS, INC. · 3873 West 150th Street · Cleveland 11, Ohio
WIRE AND CABLE FITTINGS AND ACCESSORIES

RECORDERS WORK . . . *WHILE YOU ARE BUSY ELSEWHERE*



Courtesy Nuclear Measurements Corp., Indianapolis, Indiana

This record was made by a DC Milliammeter in a monitoring unit, measuring fall-out over Indianapolis after the explosion of an experimental bomb.

The recorder was on the job continuously for 1½ days before fall-out began to increase as shown here. Meanwhile the technicians and engineers were busy at other tasks.

Make recording instruments help you multiply your effectiveness. Ask for Catalog 657.

Product Representatives in Most Principal Cities

The ESTERLINE-ANGUS Company, Inc.
Pioneers in the Manufacture of Graphic Instruments
Dept. D6, P. O. Box 596, INDIANAPOLIS 6, INDIANA

Australia Is Planning Three Power Stations

Melbourne, (McGraw-Hill World News)—The New South Wales State Government, Australia, has announced plans to construct two 800-Mw power stations at a cost of about $275 million.

Present plans provide for the two stations to be operating in about 10 years. They will be located on coal fields and each will use more than one million long tons of coal annually. Sites have not yet been announced.

At the present rate of increase in its power demand, the New South Wales State has to double its generating capacity every eight years. Three large power stations are being built but will not be in full-capacity operation for about three years. These stations are: Tallawarra (320 Mw), Wangi (330 Mw), and Wallerawang (240 Mw).

In the state of Victoria approval has been given to build a $30 million power plant at Yallourn. The State Electricity Commission of Victoria will buy boiler plants from Babcock and Wilcox Ltd., and turbine-generators, transformers, and switchgear from Australian Electrical Industries Pty, Ltd.

Hubbard & Co Plans To Build Development Center

Research and development center in the Chicago area costing more than $1 million has been planned by Hubbard and Co. Facilities at the site will enable the company to reproduce conditions encountered in utility system operations.

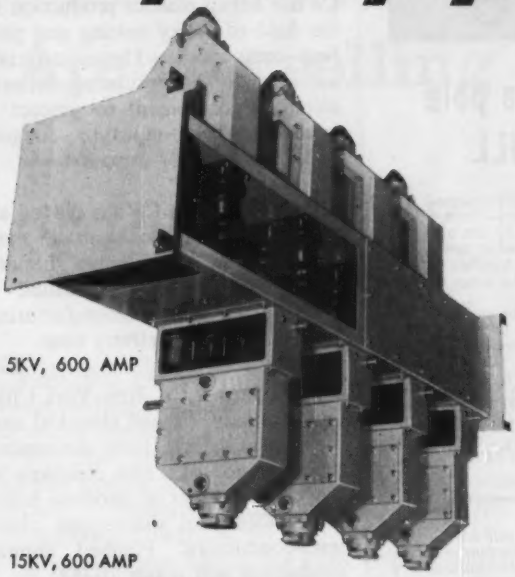
Virtually every type of transient over-voltage and over-current disturbance on an actual system can be duplicated and its effect on distribution equipment and systems can be accurately analyzed, according to Charles H. Dyson, Chairman of the Board.

High voltage laboratory equipment has been purchased from Purdue University including a 3.2-Mv impulse generator, an 80-kw-sec 100-kv surge current generator, and a 600-kv high-voltage test set.

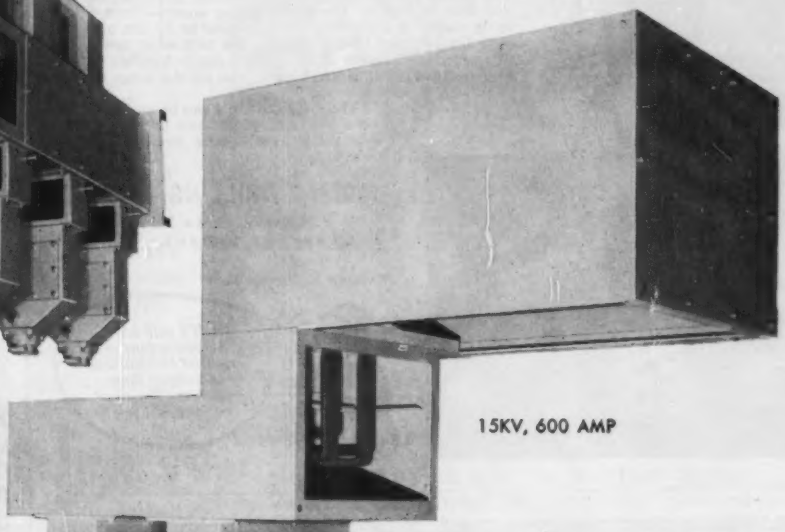
(*More M & M on page* 170)

Any way you look at it!

3E ISO-DUCTS are the most compact, practical switching centers

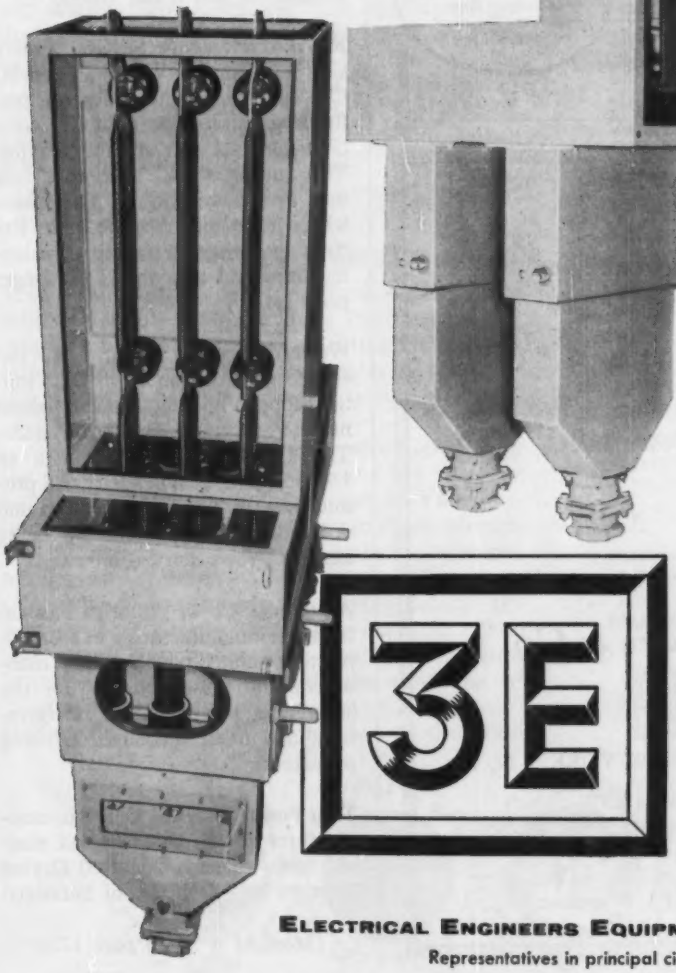


5KV, 600 AMP



15KV, 600 AMP

15KV, 600 AMP



ISO-DUCTS are Isolators, with Bus Ducts arranged for future extension in either direction.

ISO-DUCTS are safe. The bus and working parts of the Isolator are fully enclosed at all times for complete protection.

ISO-DUCTS are versatile. 3E design allows for any number of Isolators and pothead combinations. Also, the Isolators and Potheads can easily be interchanged if an arrangement change is necessary.

ISO-DUCTS save space. The Isolators straight line telescoping action performs disconnect operations using ⅓ the space needed for a comparable blade type switch.

ISO-DUCTS functional design is pleasing to the eye . . . ideal for modern factories . . . looks good and saves space in any plant.

3E

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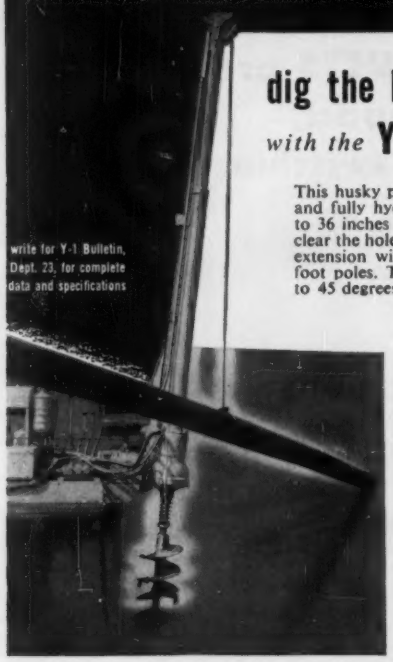
ONE SHOT OPERATION



dig the hole and set the pole
with the **Y-1 MOBILE DRILL**

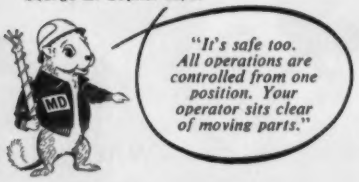
write for Y-1 Bulletin, Dept. 23, for complete data and specifications

This husky production unit is completely self-powered and fully hydraulic. The fast-working augers—from 6 to 36 inches in diameter—drive quickly to 12 feet and clear the hole rapidly and cleanly. The pole setter tower extension with motor driven winch easily handles 45 foot poles. To drill anchor holes, just tilt the auger up to 45 degrees either way.

The integrated Y-1 can be mounted on a 1½ to 2½ ton truck or tractor. 180 degree pivot base available at your option.

MOBILE DRILLING, INC.
960 N. Pennsylvania Street
INDIANAPOLIS, INDIANA

George E. Gopher says:



We have prepared a comparative study on

Electric Utilities

giving extensive data on 97 companies.

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M & M BRIEFS

Minneapolis-Honeywell Regulator Co has begun plastics production in the field of epoxy casting and potting compounds. These materials are used for encapsulating delicate electronic equipment to protect it from vibration, moisture, fungus, and other types of damage.

S. Morgan Smith Co has moved all valve operations to the main plant in York, Pa. This move, besides improving production facilities, is planned to lower manufacturing costs and shorten delivery time.

W. R. Grace & Co, New York City, and Pechiney, French chemical and metallurgical firm, have announced the formation of a new company in the United States to produce high-purity elemental silicon and other semi-conductors. Planned annual production will reach 20,000 lb.

R/W Maintenance Service, a division of Osmose Wood Preserving Co, Buffalo, has facilities for performing cutting operations in addition to basal and stump spraying. The cutting work, generally, falls into two classifications: Original—where a new line is to be built; Reclearing—where trees are threatening lines and spraying is no longer practical.

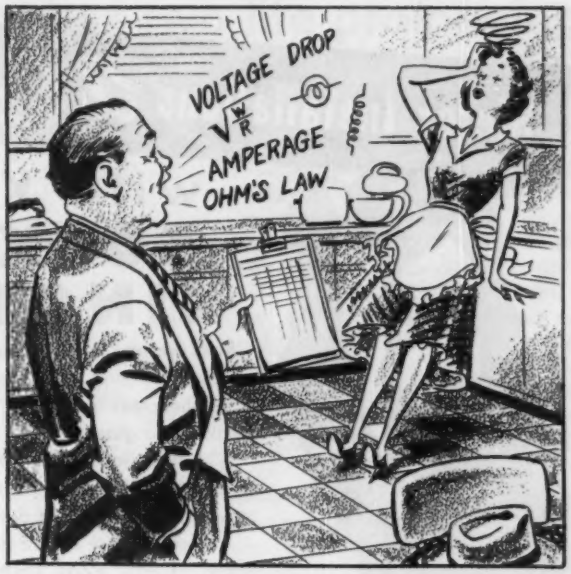
Western Copper Mills, Ltd, has started construction on its $8.5 million copper mill on Annacis Island near Vancouver, B. C., Canada. The 170,000-sq ft plant with an 18,000-ton annual capacity will produce a wide range of industrial and domestic products including many items for the electrical industry.

Aluminum Co of America has entered into manufacturing of foamed-plastic insulated panels. Mass manufacture of these "planks" for use in building, transportation, refrigeration, and other industries is being prepared.

Thor Power Tool Co, Chicago, manufacturer of portable air and electric tools, recently acquired Drying Systems Inc, producer of industrial

(*More M & M on page* 172)

Are you selling the steak or the "sizzle"?



Sure, you know all about "voltage drop" and "overloading"—and how a house should really be wired for best performance.

But how about the little lady? Chances are all she knows about electricity is that it packs a wallop. That's why she usually lets her husband change the fuses.

One thing she knows for sure, though—nothing works right anymore. The appliances act sluggish, the lights go dim, and the fuses keep blowing. That's why she's called you in.

She's been reading all about the wonders of "FULL HOUSE-POWER" and "LIVING BETTER...ELECTRICALLY"—and she wants some of the same.

This is no time to talk about "voltage-drop."

Avoid Technical Jargon

Your trade associates will know what you're talking about—but she won't. Take a tip from industry promotions now educating the public: *talk to your homeowner customers in terms of the pleasure, convenience and safety of an adequately wired home.*

Stress the enjoyment and comfort offered by the latest electrical appliances and the need for having the proper wiring to enjoy it. Your customers will respond a lot faster to these benefits—the "sizzle"—than they will to talk about amperages and voltages.

And when you explain the wiring details, try putting it in simple terms. For example, when you show how conductors feed current into branch circuits, you might use the idea of "water in a big pipe feeding into smaller pipes." Homeowners can understand that kind of talk and they'll be considerably more receptive to your sales efforts.

What Other Contractors Are Doing

Contractors who sell rewiring find they can better escape the cutthroat competition of new construction work and bid-peddling. To help them along, the industry is spending over $10 million this year to promote rewiring jobs.

Make this investment pay off for you. Tie in locally with the national wiring programs sponsored by the industry. Cooperate with trade allies. Do a little promoting on your own by advertising locally or in direct mail.

And above all, sell "better electrical living" every chance you get: through trade and civic associations, through employees—yes, even through friends and relatives.

Every one in the industry has a stake in the multi-billion dollar modernization market—yours, the contractor's, is perhaps the biggest.

Published in the interests of the Electrical Industry. Reprints of this message are available by writing to Dept. EWD at:

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Kees Socket Cincher saves time and tempers by simplifying socket meter installations . . . eliminates pounding and danger of breakage to glass covers.

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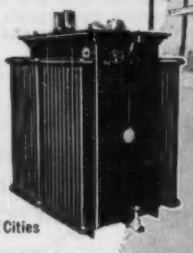
And for the finest in transformer value, this famous resort uses MARCUS for power and lighting distribution. You, too, can guarantee trouble-free performance and a real vacation from maintenance and replacement problems by specifying MARCUS for your next transformer installation.



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TRANSFORMER CO., Inc.
RAHWAY, NEW JERSEY

A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU

ovens and process air-conditioning installations. Bought in a straight cash purchase, the firm will operate as Drying Systems Co, a division of Thor Power Tool Co.

Synthetic Mica Corp, subsidiary of Mycalex Corp of America, completed a melt of Snythamica, synthetic mica, in which over 80,000 lb of raw materials were used. In their research to produce large crystals, some as large as 4 in. by 4 in. have been made.

Plant Expansions

• Purchase of the Camfield Mfg Co, (Grand Haven, Mich.) plant adjoining Keller Tool Division by Gardner-Denver Co will aid consolidation of the company's local operations. Acquisition of this 68,000 sq ft building will also allow future expansion of production facilities.

• Additional space for production and warehousing of its lighting fixture lines is underway at two of Thomas Industries, Inc, Louisville, Ky., plants. At Hopkinsville, Ky., 20,000 sq ft is being added to the company's Moe light plant while 25,000 sq ft, including show rooms, is being built onto the Los Angeles building.

• A district office and factory warehouse has been opened at Bellwood, Ill., near Chicago, by Manning, Maxwell & Moore, Inc, manufacturers of cranes, hoists, and other types of industrial products.

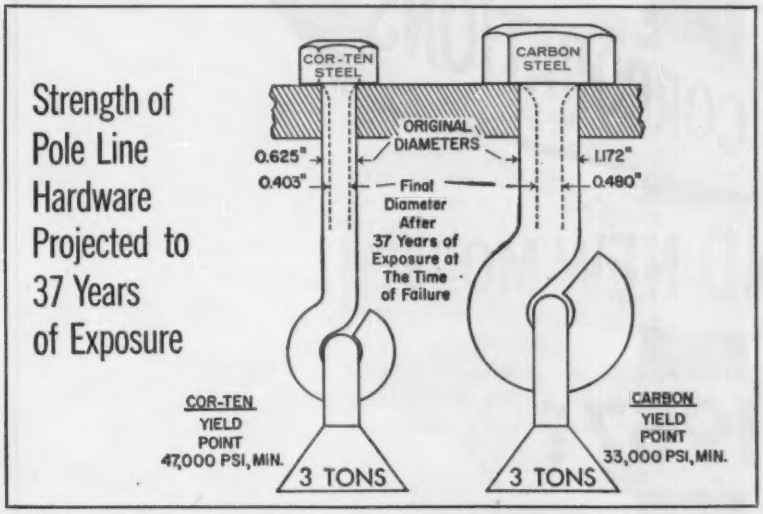
• For more than a 50% increase in production capacity of dry type transformer, saturable reactor, and indoor substation lives, a plant addition has been completed by Sorgel Electric Co, Milwaukee, Wisconsin, recently.

• To produce titanium forgings and billets, Allied-Kennecott Titanium Corp has selected Wilmington, N. C., as the site for its initial multimillion dollar plant. The site consists of 1,500 acres with about two miles of frontage on Cape Fear River.

ADVERTISEMENT

Why USS COR-TEN Steel has two life-prolonging advantages over carbon steel hardware

- Greater resistance to atmospheric corrosion
- 50% higher yield point



A graphic illustration of the superiority of USS Cor-Ten Steel over carbon steel. For a carbon steel bolt to last as long as a Cor-Ten Steel bolt under like load and atmospheric conditions, the carbon bolt would have to have nearly twice the diameter of the Cor-Ten bolt.

One of the main factors in the high cost of pole line maintenance has been the necessity of replacing all carbon steel hardware one, two or more times during the life of a treated utility pole. Due to the cost of hardware installation, even though *only a few* pieces were corroded to the point of failure, economics demanded that the crew replace *all* hardware simultaneously — rather than make several subsequent trips to the pole to replace the balance of the hardware. The answer to this costly procedure was to find an economical material that could withstand the ravages of corrosive atmospheres for the full life of a pressure-creosoted pole.

History of Success

In searching for such a material, manufacturers of pole line hardware hit upon an inexpensive steel that had a 20-year record for successfully withstanding corrosive atmospheres—USS COR-TEN High-Strength Low-Alloy Steel. Most of the initial applications of COR-TEN Steel were in railroad freight cars that were subject not only to the abrasive action of coke, coal and ore, but to the corrosive atmosphere around marine and industrial centers as well. Why were these cars of COR-TEN Steel still in service after fifteen and twenty years of punishment? Because of the great strength and high resistance to atmospheric corrosion of COR-TEN Steel.

Protective Oxide Film

USS COR-TEN Steel has two great advantages over structural carbon steel—particularly in corrosive atmospheres. First, its resistance to atmospheric corrosion is *four to six times* that of plain carbon steel. Here's how this pays off: Visualize two pieces of pole line hardware, one of carbon steel, the other of USS COR-TEN High-Strength Low-Alloy Steel. Both have a standard zinc coating for initial protection. When the galvanized coating wears away, the base metal is naturally subject to corrosion. This is when COR-TEN Steel begins to show its real worth. The initial coating of oxide that forms on COR-TEN Steel is smooth and tightly adhering. This smooth coating of oxide effectively inhibits further penetration of the corrosive atmosphere. The carbon steel, on the other hand, forms a loose, porous film of oxide that is subject to progressive penetration by the corrosive atmosphere. And it is this constant attack on the base metal that leads to rapid failure of the carbon steel hardware.

Greater Strength, Too

The second distinct advantage in using COR-TEN Steel for pole line hardware is its strength advantage over carbon steel. The yield point of COR-TEN Steel is *50% higher* than that of carbon steel. Here's how this affects service life: Even if COR-TEN Steel corroded as rapidly as carbon steel—*which it does not*—the greater strength of COR-TEN Steel means that it is still capable of many years' service after carbon steel hardware, corroded to exactly the same extent, has failed. The combination of greater resistance to atmospheric corrosion and its 50% higher yield point means that USS COR-TEN High-Strength Steel Pole Line Hardware can confidently be expected to last as long as the treated pole that supports it!

Utility Savings

It would be impossible, in this space, to point out the savings that each individual utility company would enjoy through use of COR-TEN Steel hardware. Perhaps this simple illustration can help you draw your own comparison. A maintenance crew normally consists of at least two men. Wage rates are approaching $3.00 per hour in many parts of the country. Even the simplest replacement consumes a minimum of two hours of a crew's time—to which must be added the cost of the new hardware. Simple multiplication will point out the rather staggering cost of having a crew service a pole several times over a period of fifteen or twenty years. With that frighteningly high cost figure in mind, think of COR-TEN Steel hardware . . . strong and corrosion-resistant enough to stay in service, day-in-day-out, for the full life of a pressure-creosoted pole. It makes good sense to investigate the benefits of hardware made with USS COR-TEN Steel.

More Information

Complete information on this longer-lasting hardware is contained in "USS COR-TEN Steel Pole Line Hardware." We will be glad to send you this book. Or, if you prefer, we will furnish a list of manufacturers producing pole line hardware from USS COR-TEN High-Strength Steel. Just write to United States Steel Corporation, Room 2801, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

"USS" and "COR-TEN" are registered trademarks of United States Steel Corporation.

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Florida Telephone Corporation (1st Mtge Bonds)*
Green Mountain Power Corporation
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Kansas Gas and Electric Company
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Pennsylvania Electric Company
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South Carolina Electric & Gas Company
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Texas Electric Service Company
Texas Power & Light Company
Texas Utilities Company
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Our booklet: "Public Utility financing in 1956 by Kidder, Peabody & Co. and Kidder, Peabody & Co. Incorporated", *available on request.*

. . . Kidder, Peabody & Co. and Kidder, Peabody & Co. Incorporated, in 1956, helped supply more than $1,259,000,000 to the growing Public Power industry through the underwriting and sale of 72 new utility issues. A partial list of Power Companies whose issues were managed, co-managed or placed privately by Kidder, Peabody & Co. or its corporate affiliate appears at the left.

You are invited to call on us if your corporation requires additional capital in 1957.

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ELECTRICAL BUSINESS OUTLOOK

Electrical World
SEPTEMBER 2, 1957

Electric utilities can expect the next couple of years to be good ones. The Electrical World industry forecast, which appears in this issue, shows continued growth in sales and capacity.

Total sales will hit 567.6 billion kwhr by the end of this year. In 1958 they will rise to 607 billion. And the future holds still greater expansion.

Despite the housing slump, residential sales will be up 10% in 1957. Average residential consumption will jump to 3,183 kwhr, from last year's 2,969. By 1958 the average home will use 3,444 kwhr. This will help boost total residential sales to 147 billion kwhr for 1957, 164 billion for '58.

Industrial sales will also rise. The end of 1957 will see purchases by industry up 6% to a record 292 billion kwhr, and this record will be erased next year by a figure of 305 billion kwhr.

Capital expenditure will anticipate this continued growth. By the end of this year, electric utilities will invest $4.6 billion in new facilities. And 1958 will see another jump to more than $5 billion.

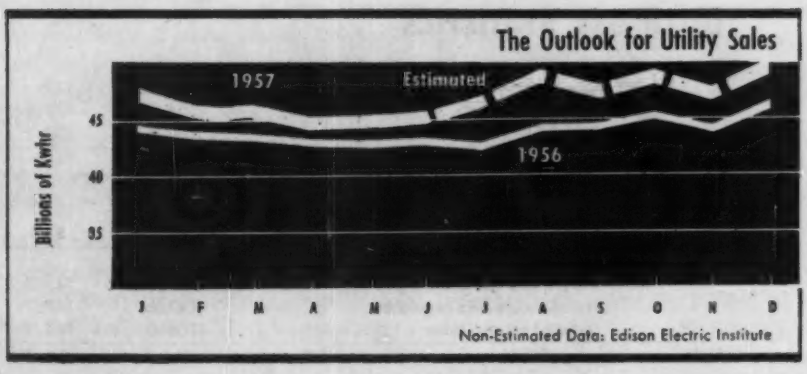
• • •

Meanwhile, despite all the talk about inflation, much of the steam under prices is beginning to disappear. The trend doesn't show up in consumer prices yet, but industrial and spot commodity prices have been anything but buoyant.

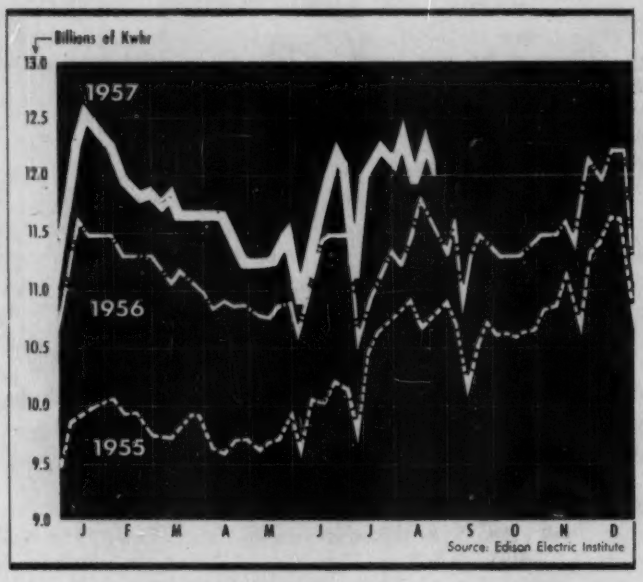
Of course, July's cost of living rose for the 11th straight month. Latest figures put the index at 120.8—up over 3% from a year ago. But most of this summer's rise ties directly to food prices which make up 30% of the overall index. And food prices usually reach a peak in summer, and then start to level off.

As for wholesale prices, it's hard to make a case for even creeping inflation. Despite the recent boosts in aluminum and steel, industrial prices have been at a standstill since February. Raw materials have also continued to drag.

Reasons for the slow-down in inflation aren't hard to find. Point one is tight money. Point two is stiffening competition. Point three is a simple fact from the latest Michigan survey on consumer buying—it seems that most people are simply fed up with rising prices.



STATISTICS



OUTPUT

Week ended August 24,
12,023,000,000 Kwhr
Up 6.0%

Per Cent Change From Previous Year

	Aug. 10	Aug. 17	Aug. 24
Total U. S.	+ 4.7	+ 5.2	+ 6.0
New Eng.	+ 4.2	+ 1.2	+ 2.6
Mid. Atlan.	+ 3.0	− 0.9	+ 1.3
Cent. Ind.	+ 3.2	+ 3.9	+ 4.9
West Cent.	+ 5.0	+10.3	+ 7.0
Southeast	+ 3.9	+ 6.3	+ 4.8
South Cent.	+ 5.6	+ 7.2	+16.0
Rocky Mount.	+ 8.0	+ 6.3	+ 6.3
Pacific			
NW	+10.5	+ 8.9	+ 8.6
SW	+ 7.3	+10.5	+ 9.4

Seasonally Adjusted Index 227.0
Week Ago 234.5
Year Ago 213.5

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 7.4%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	June	124.43	122.79	117.50	5.9
Peak—Class 1 Systems, million kw	May	97.8	97.7	92.8	5.4
Estimated Dec. '57 Peak	May	113.6	113.8	114.3	−0.6
Production—billion kwhr	June	52.05	51.70	49.45	5.3
Hydro		11.18	11.80	10.05	11.3
Fuel		40.87	39.90	39.40	3.7
Sales—billion kwhr	May	46.60	47.15	44.18	5.5
Residential		11.86	12.72	11.07	7.1
Commercial		7.38	7.25	6.75	9.3
Industrial		24.89	24.66	24.03	3.6
Other		2.48	2.52	2.33	6.4
Fuel Consumption	June				
Coal—million tons		12.50	12.60	12.34	1.3
Oil—million barrels		6.24	6.31	4.61	35.4
Gas—billion cu ft		125.72	108.66	127.04	−1.0
Net Income Class A & B Co's—$ million	June	109.69	101.75	101.54	8.0
Residential Customers—millions	12 mos.	46.16	46.06	44.86	2.9
Revenue per kwhr	ended	2.58¢	2.58¢	2.62¢	−1.5
Avg kwhr per customer	May 31	3,047	3,034	2,858	6.6
Avg annual bill		$78.61	$78.28	$74.88	5.0

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	July	135	145	128	5.5
ENR Construction Cost	Aug.	154.8	151.8	146.0	6.0
BLS Cost-of-living	July	120.8	120.2	117.0	3.2
New Orders for Machinery (1950 = 100)	June	155	149	154	0.6
NEMA Sales					
Insulation materials	June	140	148	156	−10.3
Electric appliances		93	88	106	−12.3
Wholesale prices	June				
Motors and generators		141.0	141.3	132.3	6.6
Transformers and regulators		147.8	147.7	138.2	6.9
Switchgear and fuses		166.0	165.9	152.3	9.0
GNP—annual rate—$ billion	2nd qtr.	434.4	429.1	410.8	5.7

MANAGEMENT BULLETIN

FINANCE

Total of $330 million in new security issues for this month is scheduled by electric utilities, says John Childs, vp of Irving Trust Co. So far the utilities plan to offer another $290 million in October.

As of now, November and December look light, he declares. However, expected financing indicates that these months will have a normal volume.

Electric companies are raising most of their requirements through debt financing. Of the $950 million planned for these companies for the balance of the year, 88% will be in bonds, Childs says.

Electric companies have done more "new money" financing in the first seven months of this year than they did in the entire year 1956.

In spite of climbing interest rates, he observes, "most revisions in 1957 financing plans have been on the upward side. Of all the electric companies included in the 'Financing Calendar,' 22% have enlarged on their original financing plans this year. Only 6% have made any reductions, and these were slight ones."

With this heavy financing program coming up, Federal Reserve Board Chief McChesney Martin's testimony before the Senate Appropriations Committee contained a consoling statement to utilities. He said that he thought interest rates may be as high as they're going and might even decline.

As one banker put it recently, it could be that the record demand for money which has continued for several years, "may well be 'teetering' on the edge of a decline. Let business activity levels, backlogs, or sales show a dipping tendency as to any appreciable part of industry and expansion may promptly be curtailed, and then down may come spending and interest rates and all."

Common stock dividend increase. Potomac Electric Power Co will pay Sept. 30 a quarterly dividend of 30¢ a share compared with 27½¢ in the previous quarter.

The $5 million 5¾% first mtg bond issue of Iowa Southern Utilities Co met with good reception. It was sold quickly at a yield around 20 basic points lower than the previous week's return on similar issues.

RATES

Including the request of Montana Power Co to raise rates by 12 to 19%, there are now 20 electric companies with increases in the hopper. Of these, 16 request an additional $122 million a year. So far in 1957 eight companies have been granted increases of which six have received over $3.9 million a year. In 1956, electric companies got $7 million a year in rate hikes.

ACQUISITIONS

Electric utilities take over two municipal electric systems and make offers for two others. Central Illinois Public Service Co acquires the Flora municipal light plant which serves some 2,000 customers . . . Dayton Power & Light Co purchases the municipal electric power and water plants at Sabina, Ohio, for $325,997 . . . Toledo Edison Co has offered to buy the municipal distribution system at Genoa, Ohio, for more than $200,000. A similar offer was rejected three years ago . . . Texas Power & Light Co offered to buy Terrell municipal system for $1.4 million.

Maine co-op plans to take over a power company. Denny's River Electric Cooperative, Inc, Calais, Maine, has received a $2,430,400 loan from the Rural Electrification Administration which, together with other funds, will be used to purchase the electric generating facilities of the St. Croix Electric Co at Calais.

MANAGEMENT BULLETIN continued

PUBLIC RELATIONS

"Directory of Retired Employees" is published by Central Power & Light Co in its July publication "CPL News." It shows the employee's name and address, date first employed, last position with the company, and date of retirement. In publishing this list, the magazine editor says: "We consider them among the most valuable members of the CPL family."

EMPLOYEE RELATIONS

Are top executives taking all the vacation they are entitled to? Recent American Management Association survey shows that this is not the case. Of 96 randomly surveyed members (8 presidents, 69 vp's and 20 others such as chairmen, general managers, etc), 46 reported they "used less than the total amount of vacation time allocated to them by their companies last year." Four of the 46 took no vacation at all.

Only four respondents, the survey shows, took longer vacations than were assigned to them in 1956. Thirty-seven took the full time allotted. Nine said the length of their vacations was left entirely to their own discretion; two of them did not take vacations.

Here are the latest wage increases. Threatened strike is averted when Eastern Shore Public Service Co of Maryland, Eastern Shore Public Service Co of Virginia Delaware Power & Light Co and IBEW agree to a 5½% wage increase. Accord came in the 34th day of negotiations and only hours after the workers had voted 263 to 58 to strike. . . . Ohio Edison Co and IBEW agree to a 5.1% wage hike, retroactive to July 1.

Wage increases in electrical machinery, equipment, and supplies industry ending last April were higher than in any other industry in New York, says the state's Department of Labor in its August "Industrial Bulletin." The average hourly earnings of the industry were up 6.7% in April 1957 over the same month of 1956.

MAPS

Electric regional maps for 1957 are now available from the Federal Power Commission. Known as the "Principal Electric Utility Generating Stations and Transmission Lines in the U. S.", it has been revised to show all changes to June 30, 1956. Price of the complete set of 12 regional maps, including supplementary sheets and the plant and ownership list, is $5. Individual regional maps are 50¢ each. There is no charge for supplementary sheets when the accompanying individual map is purchased. Maps can be obtained from the Office of Public Reference, FPC, Washington 25, D. C. Order number for the set is FPC-M-49.

'CHEAP' POWER

Here's a recent comment by Rep James B. Utt (R-Cal.) "The Dixon-Yates contract was cancelled because the people in that area were clamoring for 'cheap power.' The irony of this so-called 'cheap public power' is now apparent, as Dixon-Yates had contracted to sell its power for 3.98 mills per kwhr and the City of Memphis, which constructed its own plant and does not have to include income tax nor property tax as a component in its rate base, has set a price of 4.48 mills as the lowest figure at which it can produce a kwhr of power," he declared.

"In other words," he continued, "cheap public power' is costing the City of Memphis a half mill per kwhr more than they could have contracted with Dixon-Yates and the tax revenue loss to the federal and local governments is several million dollars. In the matter of TVA you must remember that there are over a billion and a half dollars of your money invested in this project for which no interest whatsoever is paid."

Outdoor Station

features

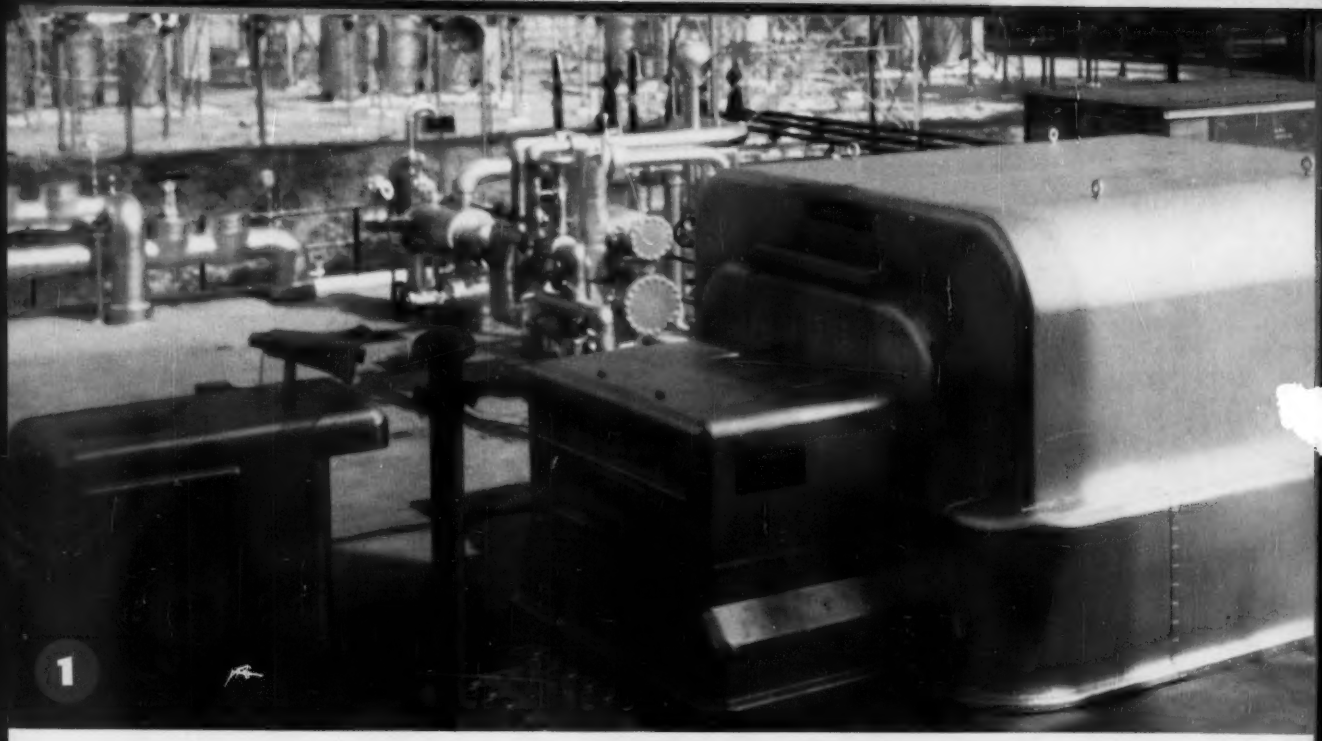
Wide Range of Allis-Chalmers Equipment

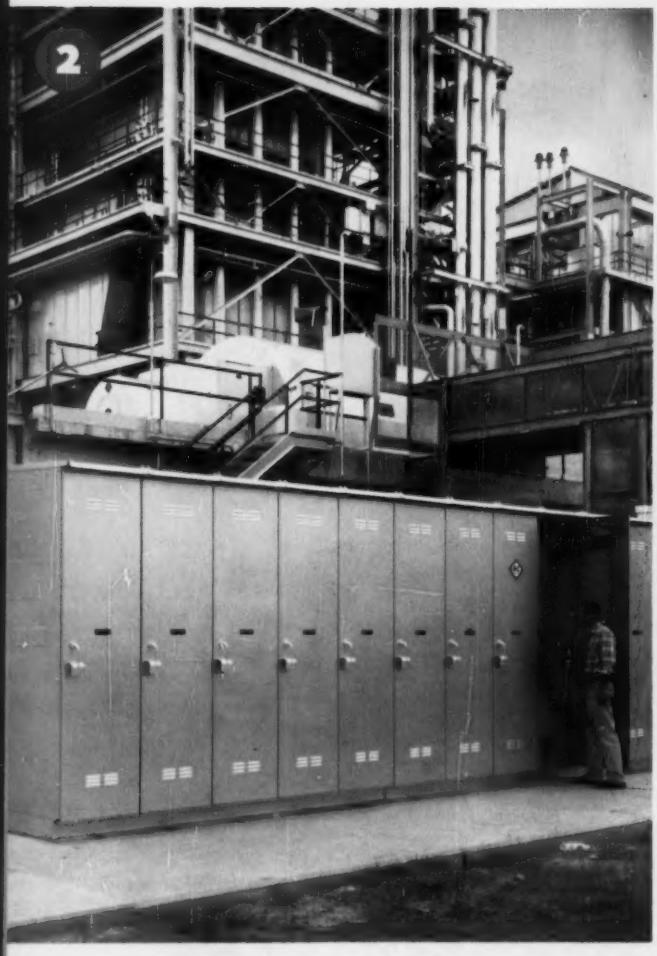
Here's the new addition to the Palatka Station of Florida Power and Light Company, which was engineered and constructed by Ebasco Services Incorporated. This new power station symbolizes the growth, the drive, the fresh modern look that is everywhere in sunny Florida today. It also offers testimony to the close coordination and planning between engineers from the utility, Ebasco, and Allis-Chalmers on a wide range of problems.

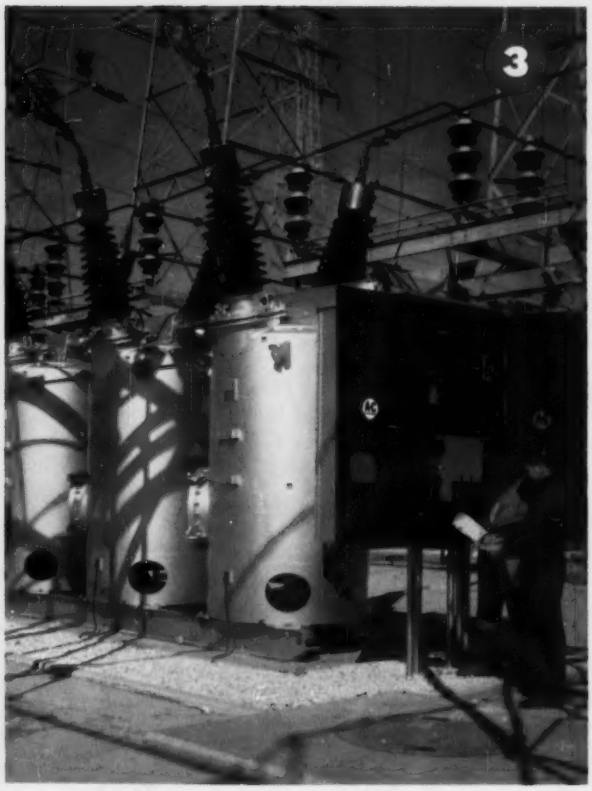
A-5361

Palatka Station

ALLIS-CHALMERS







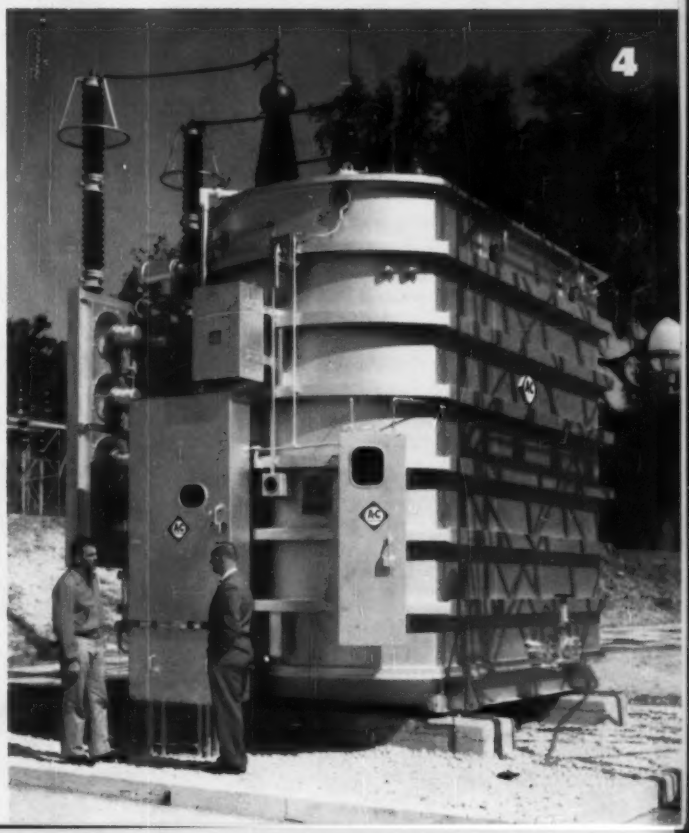
A-C ALLIS-CHALMERS ALLIS-

1. At the heart of things is the 62,500-kw outdoor steam turbine generator unit, featuring permanent side-crossunders between high and low pressure tandem turbines, steam valves below deck, supercharged generator with direct hydrogen-cooling of rotor copper, and commutatorless excitation system with inherent rapid-response voltage regulation. Units to 220,000 kw are in production by Allis-Chalmers for outdoor stations.

2. Switchgear — Allis-Chalmers 2400-volt and 480-volt outdoor weatherproof switchgear controls major station auxiliaries.

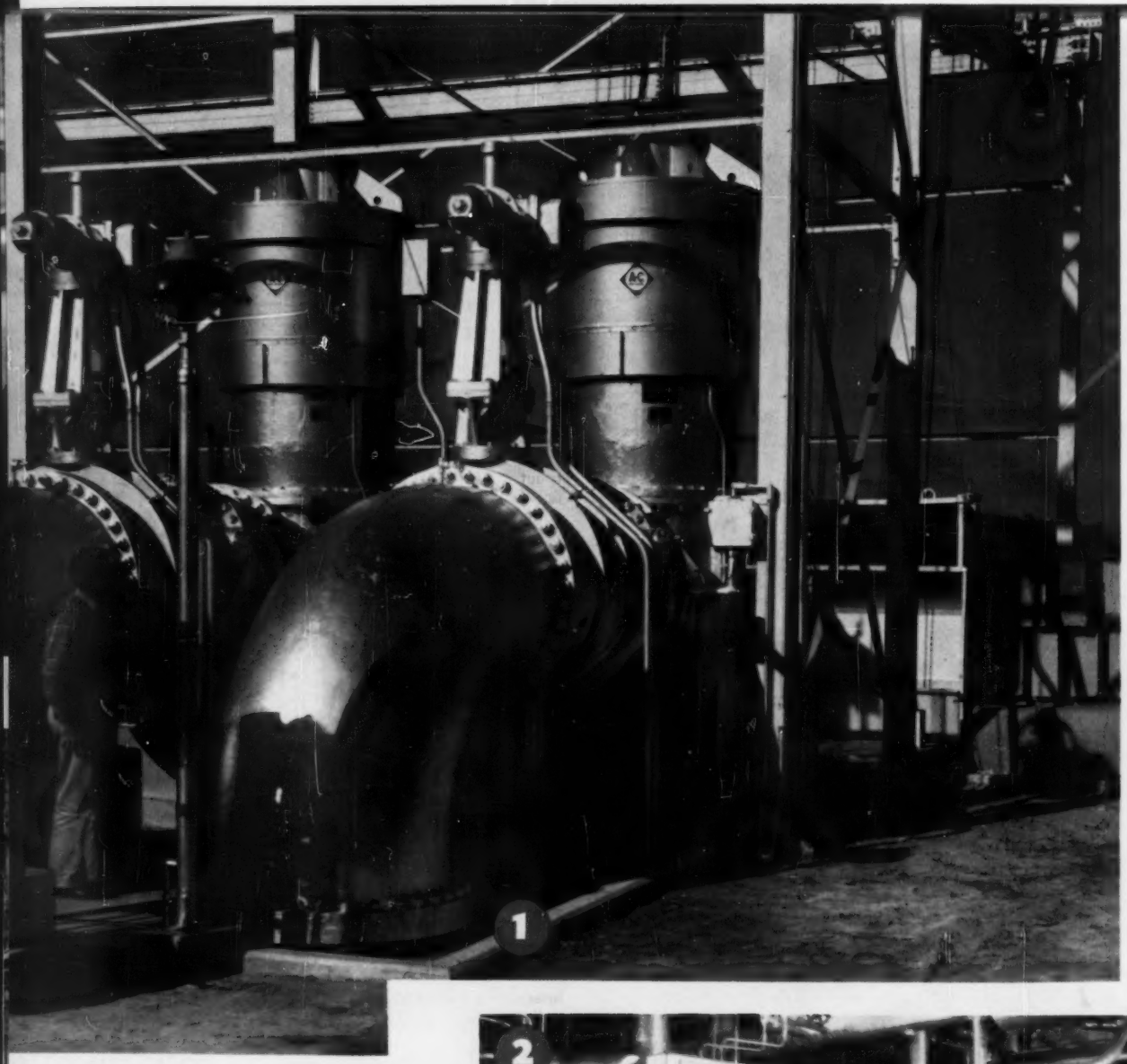
3. Circuit Breakers — *Pneu-Draulic* operators and mechanically trip-free operation are features of three 115-kv Allis-Chalmers circuit breakers.

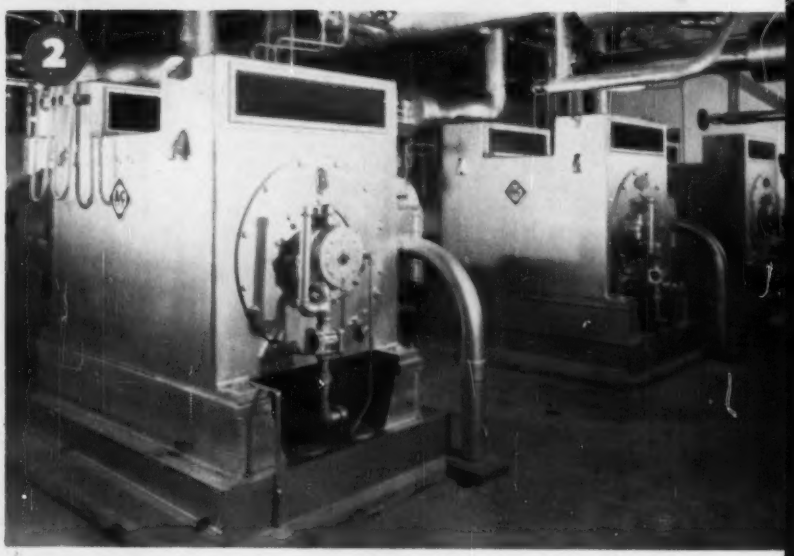
4. Transformers — This 85,000-kva forced oil cooled power transformer is for main step-up service to the 115-kv lines.



Pneu-Draulic is an Allis-Chalmers trademark.

CHALMERS





1. **Pumps-Motors** — Shown above are two vertical weather-protected motor-pump units furnished by Allis-Chalmers.

2. **Control Centers-Motors** — For boiler feed pumps; induced and forced draft fans were furnished by Allis-Chalmers.

For the complete story on *all* the products Allis-Chalmers builds for electric power generation, distribution and utilization, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

MEETINGS CALENDAR

SEPTEMBER

American Institute of Electrical Engineers—2nd Special Technical Conference and Exhibit on Magnetic Amplifiers, Hotel Penn Sheraton, Pittsburgh, Pennsylvania, September 4-6; Sixth Annual Industrial Electronics Symposium, co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Ill., Sept. 24-25.

Northwest Electric Light & Power Association—50th Annual Meeting, Glacier Park Hotel, Glacier National Park, Montana, Sept. 5-6.

Instrument Society of America—12th Annual Instrument Automation Conference and Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 9-13.

Illuminating Engineering Society—National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

Electric Companies Public Information Program—Steering Committee, New York City, Sept. 11; Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

Edison Electric Institute—Industrial Power & Heating Group, Van Curler Hotel, Schenectady, N. Y., Sept. 11-13; Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25; Meter & Service Committee, Hotel Nicolet, Minneapolis, Sept. 23-25; Electrical Systems and Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

Electric Companies Advertising Program—Management Group Meeting, Hotel Pierre, New York City, Sept. 13; Copy Group Meeting, Detroit, Mich., Sept. 25.

Maryland Utilities Association—33rd Annual Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 13-14.

Southeastern Electric Exchange—Engineering & Operation Section, Biltmore Hotel, Atlanta, Ga., Sept. 19-20.

• **Pennsylvania Electric Association**—Structures and Hydraulics Committee, Highland Hotel, Massena, New York, Sept. 19-21.

Public Utilities Association of the Virginias—39th Annual Meeting, White Sulphur Springs, West Virginia, Sept. 19-21.

Missouri Valley Electric Association—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 23-24.

American Society of Mechanical Engineers—Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

• **Inter-Industry Farm Electric Utilization Council**—National Power Workshop, Fourth Annual Meeting, Shirley-Savoy Hotel, Denver, Colo., Sept. 29-Oct. 1.

OCTOBER

Pennsylvania Electric Association—50th Annual Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 2-3; Communications Committees, Abraham Lincoln Hotel, Reading, Pa., Oct. 7-8; Meter Committee, Shenango Inn, Sharon, Pa., Oct. 10-11; Relay Committee, Abraham Lincoln Hotel, Reading, Pa., Oct. 17-18; Systems Operations Committee, Bedford Springs Hotel, Bedford, Pa., Oct. 24-25; Transmission & Distribution Committees, Lord Baltimore Hotel, Baltimore, Md., Oct. 31-Nov. 1.

Indiana Electric Association — French Lick-Sheraton Hotel, French Lick, Ind., Oct. 2-4.

Missouri Valley Electric Association—Sales & Rural Conference, (and Home Service Workshop), Lassen Hotel, Wichita, Kansas, Oct. 2-4.

International Association of Electrical Leagues—Annual Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, October 2-5.

National Industrial Conference Board—Atomic Energy Course for Management, Hotel Moraine on the Lake, Highland Park, Ill., Oct. 6-12.

Iowa Utilities Association — Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 7-8.

Edison Electric Institute—Prime Movers Committee, Hotel New Yorker, New York City, Oct. 7-9; Area Development Workshop, Phoenix Hotel, Lexington, Ky., Oct. 9-11; Transmission & Distribution Committee, Statler Hotel, Boston, Massachusetts, October 17-18; Accounting Division Taxation Accounting Committee, held jointly with AGA, Williamsburg, Virginia, October 23-25.

American Society of Mechanical Engineers—Lubrication Conference, sponsored jointly with American Society of Lubrication Engineers, Royal York Hotel, Toronto, Canada, Oct. 7-9; Power Conference, American Hotel, Allentown, Pennsylvania, Oct. 21-23.

National Electronics Conference, Inc—13th Annual Meeting, Hotel Sherman, Chicago, Ill., Oct. 7-9.

American Institute of Electrical Engineers—Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 7-11; Computers in Control Symposium, Hotel Claridge, Atlantic City, N. J., Oct. 16-18.

Electrical Association of Philadelphia—15th Electrical Progress Show, Convention Hall, Philadelphia, Pa., Oct. 8-10.

Southeastern Electric Exchange—Accounting Section, Fort Sumter Hotel, Charleston, S. C., Oct. 10-11; Sales Section, Tutwiler Hotel, Birmingham, Ala., Oct. 16-18.

Rocky Mountain Electric League — 54th Annual Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 13-17.

Interstate Power Club — Hotel Martinique, New York City, N. Y., Oct. 14.

National Safety Congress—Conrad Hilton Hotel, Chicago, Ill., Oct. 21-25.

Oklahoma Utilities Association — Electric Light and Power Division, Woodward, Okla., Oct. 25; Eastern District, Bartlesville, Okla., Oct. 25.

Atomic Industrial Forum—Annual Conference, New York City, Oct. 28-30.

American Nuclear Society—Winter Meeting, New York City, Oct. 28-30.

National Association of Railroad Utilities Commissioners — Annual Conference, Peabody Hotel, Memphis, Tennessee, October 28-31.

Industrial Management Society—21st Anniversary Industrial and Management Clinic, Hotel Sherman, Chicago, Ill., Oct. 30-Nov. 1.

Institute of Radio Engineers—3rd Annual Technical Conference of the Professional Group on Electron Devices, Shoreham Hotel, Washington, D. C., Oct. 31-Nov. 1.

• Additions this week.

Florida Power's VP Foley Gets New Titles

Vice President George F. Foley of Florida Power Corp has been elected vice president, secretary, and treasurer of the utility and a member of the board of directors. In his new position he succeeds E. K. IlgenFritz, who will continue with the company in the capacity of financial consultant.

Foley has been a vice president since January of 1955 and has served as assistant secretary and assistant treasurer of Florida Power for over eleven years.

A 1924 graduate of Brown University, Foley has been in the utility field since 1927, when he became associated with the Utility Management Co. Since that time he has been vice president of Kentucky-Tennessee Light & Power Co; and has served as secretary-treasurer of Louisiana Public Utilities Co, Texas General Utilities Co, Tri-City Utilities Co, and Owensboro Gas Co.

GEORGE F. FOLEY

Twohey Rises to VP Position

Edward G. Twohey is newly elected vice president of the Narragansett Electric Co, a subsidiary of New England Electric System.

Twohey, who received his electrical engineering degree in 1925 from Norwich University, joined Lowell Electric Light as a student engineer. In 1929 he became assistant to the manager of Worcester County Electric Co and rose the next year to merchandise manager of Lawrence Gas & Electric Co. He was named a vice president of Northampton Electric Co in 1942 and later held the same office in the Worcester utility. With the formation of the NEES gas division, he became its chief executive officer, the post he held until his present promotion.

Succeeding Twohey in the latter capacity is Harold L. Dalbeck, former assistant treasurer of NEES subsidiaries northeast of Boston.

EDWARD G. TWOHEY

Welsh Heads New Atom Group

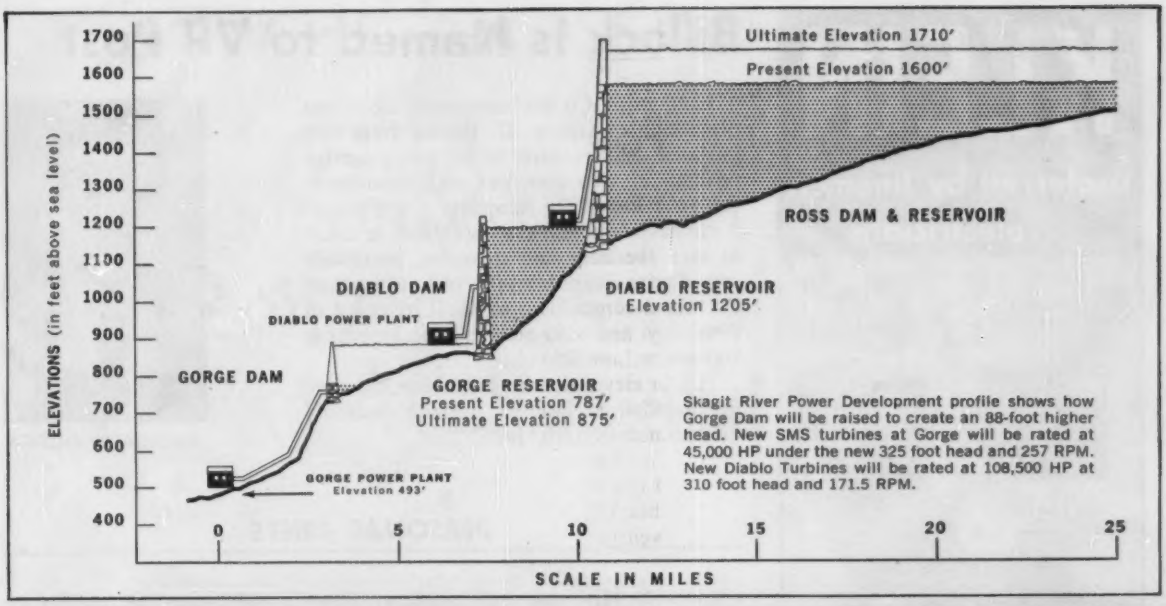
J. Robert Welsh, president of Southwestern Gas & Electric Co, has also been named president of Southwest Atomic Energy Associates.

The latter group, composed of 13 electric utilities, was formed recently to conduct extensive research studies to develop a practical use of nuclear energy as supplemental fuel for future electrical needs.

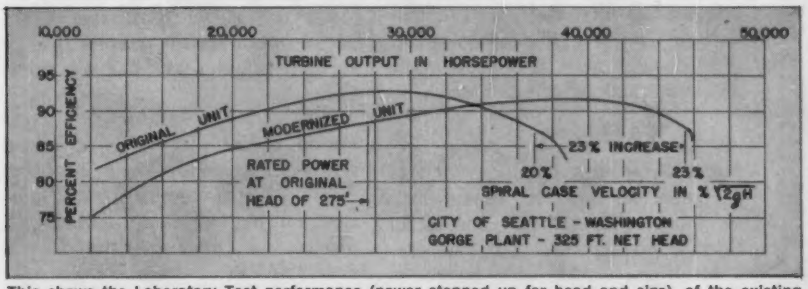
Welsh, the group's first president, has served in various executive capacities during his 17 years with SWG&E. These include superintendent of power, vice president-operations, and vice president-general manager.

Serving as vice-presidents of SAEA are W. O. Turner, president of Louisiana P&L and Gordon W. Evans, president of Kansas G&E.

Other member companies include Arkansas-Missouri Power, Arkansas P&L, Central Louisiana Electric, Empire District Electric, Gulf States Utilities, Mississippi P&L, Missouri Public Service, New Orleans Public Service, Oklahoma G&E, and Public Service of Oklahoma.



Skagit River Power Development profile shows how Gorge Dam will be raised to create an 88-foot higher head. New SMS turbines at Gorge will be rated at 45,000 HP under the new 325 foot head and 257 RPM. New Diablo Turbines will be rated at 108,500 HP at 310 foot head and 171.5 RPM.



This shows the Laboratory Test performance (power stepped up for head and size), of the existing Gorge runners under the higher head and the new runner and gate design for the same conditions.

A complete model of the Gorge wheel case assembly, built to extreme accuracy, is shown being mounted in the test chamber of the SMS high-head test stand.

CITY OF SEATTLE TO GET MORE POWER

New SMS Turbines In Modernization of Gorge, Diablo Facilities Will Help Increase Capacity 23%

As part of its program to get more power, Seattle, Washington's Skagit River development includes replacement of 35- and 22-year-old turbine runners at the Gorge and Diablo plants, and increasing the height of the Gorge Dam. Rebuilt vertical SMS-Francis runners and new wheel case accessories will give each unit 23% more capacity in the existing wheel cases.

Extensive model tests were conducted for these turbines in the SMS Laboratory's high-head test stand. They proved that the proposed new runner and modified gate designs would not only provide the increased power with very little loss in efficiency, but would have improved cavitation characteristics which permit maintaining the original setting above tailwater elevation.

Research results such as these indicate SMS can provide substantial economies in both new and existing installations with higher turbine speeds and settings as well as smaller spiral cases and inlet valves. A general discussion of turbine rehabilitation, as given at a recent technical presentation, is available without cost. Write on company letterhead to S. Morgan Smith Company, York, Pennsylvania.

More Power To . . .

S. MORGAN SMITH

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Now in Nylon Klein-Kord safety straps Klein still leads with the newest in safety equipment specially designed for use by utilities wherever power or communication lines are strung.

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Billock Is Named to VP Post

Hubbard & Co has announced the recent promotion of George D. Billock from vice president and treasurer to the newly created position of vice president and assistant to the president of the company.

Billock, who came to Hubbard in 1955 as vice president and treasurer, previously served as assistant treasurer of Latrobe Steel Co. He is a graduate of the University of Pittsburgh and also attended the Duquesne University Law School.

His former positions have been assumed by Marshall S. Delevan, former controller of Alexander Smith, Inc.

GEORGE D. BILLOCK

PERSONAL BRIEFS

Charles D. Lyon is new general commercial manager of Potomac Edison Co . . . The McMinnville (Ore.) water and light department has appointed **Alan Jones** manager.

At Southern Nevada Power Co, **Harry Allen** has been elevated to executive assistant; **Z. D. Lowman** to commercial manager; and **A. E. Pearson** to supervisor of customer accounting, credit, and collection responsibilities, in addition to his duties as treasurer.

Citizens Utilities Co, Stamford, Conn., has named **Peter J. McTague** assistant to the vice president and **Martin P. Kuric** executive assistant.

L. D. Kneen succeeds **Harold G. Huey** as manager of Northern States Power Co's general office merchandise sales department. Huey has retired after 38 years with the utility.

New assistant chief electrical engineer of Los Angeles Department of Water & Power is **Arthur L. Williams.** He assumes the position vacated by **James D. Laughlin,** retired.

The newly created position of budget director of Arizona Public Service Co has been assumed by **M. H. Diels.**

New manager of the rate and standard practice division of Philadelphia Electric Co is **D. F. Kurtz.**

Ray C. Armstrong was recently assigned to the post of assistant manager of operations of Atomic Energy Commission's Oak Ridge operations.

Union Electric Co has advanced **David L. Klumb** to senior assistant engineer in the engineering and construction department . . . **Harry G. Moore** and **Temp S. Davis, Jr,** are new assistant manager of Georgia Power Co's Atlanta Division.

At El Paso Electric Co, **William D. Burgess** has joined the company as assistant to the president . . . **Rod McMullin** was recently appointed general manager of Salt River Power District.

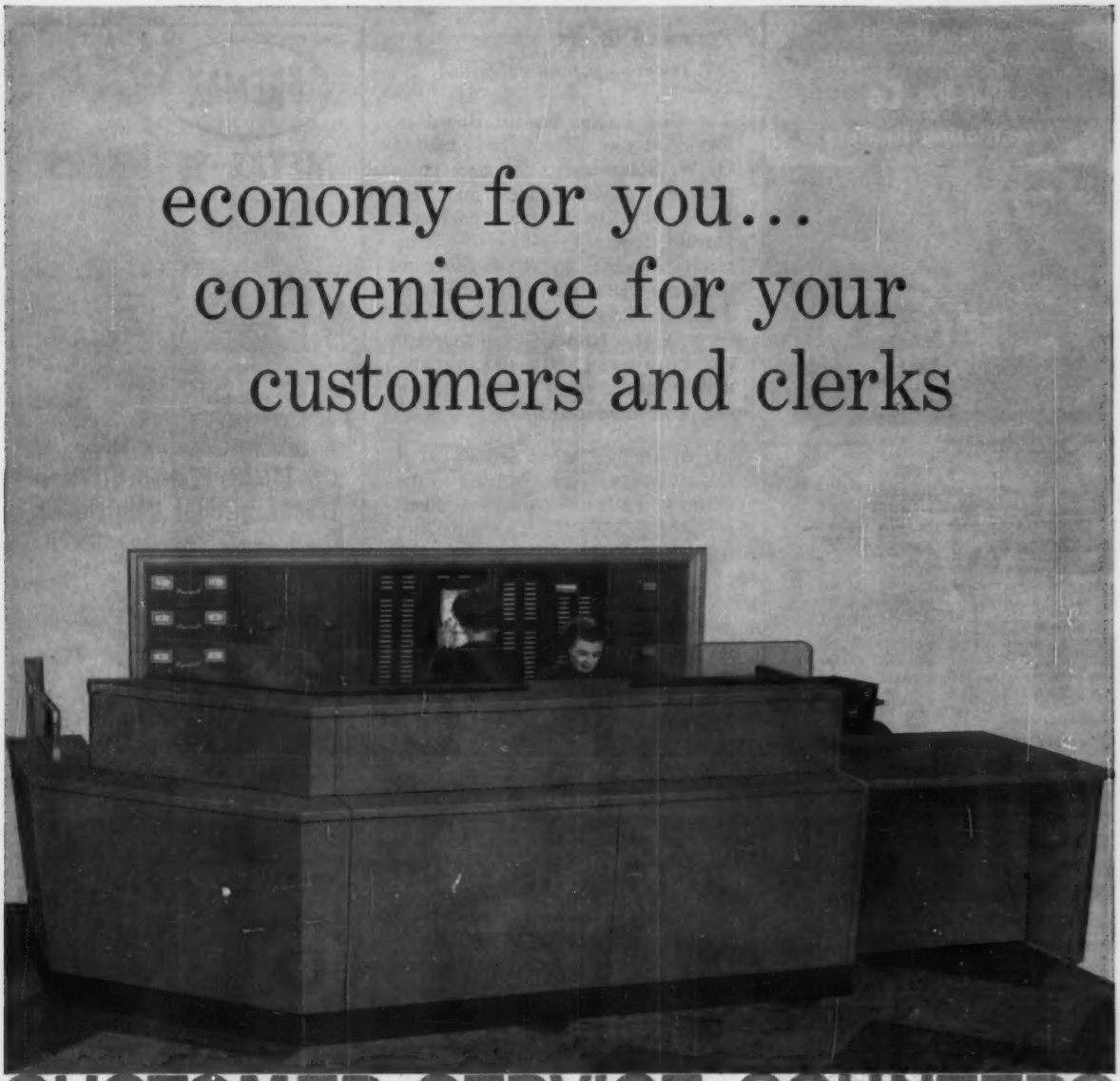
Ralph R. Marshall, recently named business manager for the Hugo area of Public Service Co of Oklahoma, has been advanced to acting manager for the area upon the retirement of **W. B. Harris.**

New Elmhurst district superintendent at Commonwealth Edison Co is **Al Agrimonti.**

Edward F. Jaenisch has been promoted to general sales manager of Louisville Gas & Electric Co.

Hydro-Quebec's Metropolitan Operation Division has appointed **Harold H. Remine** chief engineer, following the retirement of **R. Norman Coke.**

(*Continued on page* 188)



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Customers appreciate the convenience of fast service and the continuous ledge which serves as a handy parcel shelf. In larger offices two or more units may be joined, providing any desired number of work stations. Discover the many advantages of "face-to-face" service plus 24 hour protection provided by Customer Service Counters. Write today for booklet SC791, Room 1975, 315 Fourth Avenue, New York 10, N. Y.

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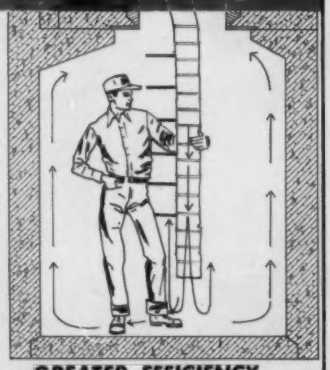

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Personal Briefs

(*Continued from page* 186)

The City Public Service Board of San Antonio (Tex.) has named **O. W. Sommers** to the new position of assistant general manager; **J. E. Sheehan** to staff engineer; **Harold Tynan** to manager of the electric system; **R. H. Gardner** to secretary-treasurer; **Murray Jolly** to manager of the distribution department; **C. G. Krause** to manager of the engineering department; and **Milton Zimmerman** to manager of the power department.

M. M. Koch of Public Service Co of Colorado was recently raised to the grade of Fellow in American Institute of Engineers . . . The American Society of Mechanical Engineers has elected four engineers to the rank of Fellow: **Ray N. Benjamin,** vice president-chief engineer of Georgia Power Co; **George M. Muschamp,** vice president-engineering, Minneapolis-Honeywell Regulator Co; Thomas F. Perkinson, transportation manager, General Electric Co; and **Carey H. Brown,** formerly of Eastman Kodak Co.

National Industrial Advertisers Assn has elected as vice president **Albert R. Teifeld,** director of advertising and public relations for Copperweld Steel Co.

The 1957-58 national chairman of the dealer coordination committee of Edison Electric Institute's residential group is **Charles A. Byron,** residential sales manager of Connecticut Light & Power Co.

J. L. McEachin, Minnesota Power & Light Co's vice president-general sales manager, has been elected chairman of the North Central Electrical League . . . New manager of the Minnesota Electrical Assn is **Harry W. Kane.**

Paul J. Christiansen, former general counsel of McGraw-Edison Co's Thomas A. Edison Industries Division, has been named president of the division to succeed **Henry G. Riter III,** who has resigned.

Dr. Eugene Willihnganz has assumed the new position of director of research for C&D Batteries, Inc.

(*Continued on page* 190)

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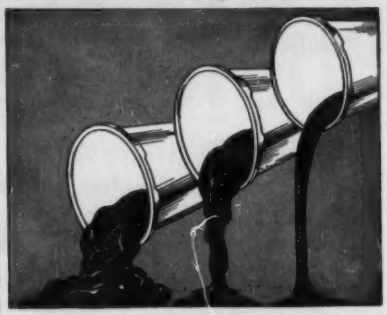
Insulating and Cable-Pulling

COMPOUNDS

of Record-Breaking Performance



Minerallac gives you a complete assortment for every need: dense, viscous and fluid consistencies for high and low voltages in cable-joints, pot-heads, terminal bells, distribution cables, street lighting, telephone work. . . . Insoluble in oil or water, for all temperatures. Clean, safe, economical—outranks all others in quality.

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Many companies keep up-to-date on constantly changing insurance problems by calling in Ebasco for periodic surveys. It helps them get the most insurance protection at lowest costs.

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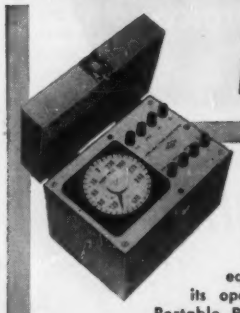

Completely self-contained, and requiring no auxiliary equipment for its operation, this Portable Phase Angle Meter offers a direct way of checking relay and instrument connections, particularly directional over-current relays, differential relays or similar equipment. It may also be used to measure the prevailing power factor in each phase of a polyphase watthour meter installation. The device has a frequency of 60 cycle, with voltage ranges of 60, 120 and 240 volt. Current ranges are 1, 2.5 and 5 amp. . . . DIMENSIONS: 9½ x 6¾ x 5⅝ inches. Weight 19 pounds.

Also available in other voltage combinations

Write for Bulletin #75 for complete information

EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA.

Personal Briefs

(*Continued from page* 188)

Allis-Chalmers Manufacturing Co has named **M. P. Getting, Jr,** as engineer-core steel operations . . . New domestic sales manager of Four Wheel Drive Auto Co is **Lloyd L. Pernot.**

Worthington Corp has elected **William A. Meiter** to the new post of vice president-employee relations and organization development.

Radio Corp of America's newly formed industrial electronic products component will be managed by **A. R. Hopkins . . . Charles A. Daly, Jr,** has been advanced to manager of general purchasing for the company.

Dr Thomas H. Johnson, director of the Atomic Energy Commission's research division in the physical sciences, has resigned effective Oct. 1 to become manager of the research division of Raytheon Mfg. Co.

Stanley A. Ward, former general manager of Salt River Power District, has joined Bechtel Corp as an executive engineer, power division.

Sylvania Electric Products, Inc, has appointed **Paul P. Twomey** as manager of distribution cost control for the Lighting Division.

The newly created post of works manager of Rockbestos Products Corp has been filled by **Alexander S. Basil,** former manager of sales development for U. S. Rubber Co's electrical products.

At Kaiser Aluminum & Chemical Corp, **J. T. Dugall** has been appointed general manager of the electrical conductor division.

Paul Jordan has advanced to director of engineering of Dodge Manufacturing Corp . . . The Remington Rand Division of Sperry Rand Corp has designated **Dr Thornton C. Fry** as vice president and director of Univac engineering.

Thor Power Tool Co has named **William J. McGraw** manager of its electric tool sales division and **John Trumble** as factory manager of its Aurora Works.

(*Continued on page* 192)

GIVE TRANSFORMERS *Full advantages* of SELF-COOLING

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Engineered by specialists to give *any make of transformer* the full economies and trouble-free operation of thermosiphon self-cooling. Design standard for the transformer industry—oval tubes assure optimum heat dissipating surface and free flow characteristics. Valves, flanges, and elbows available for any mounting condition.

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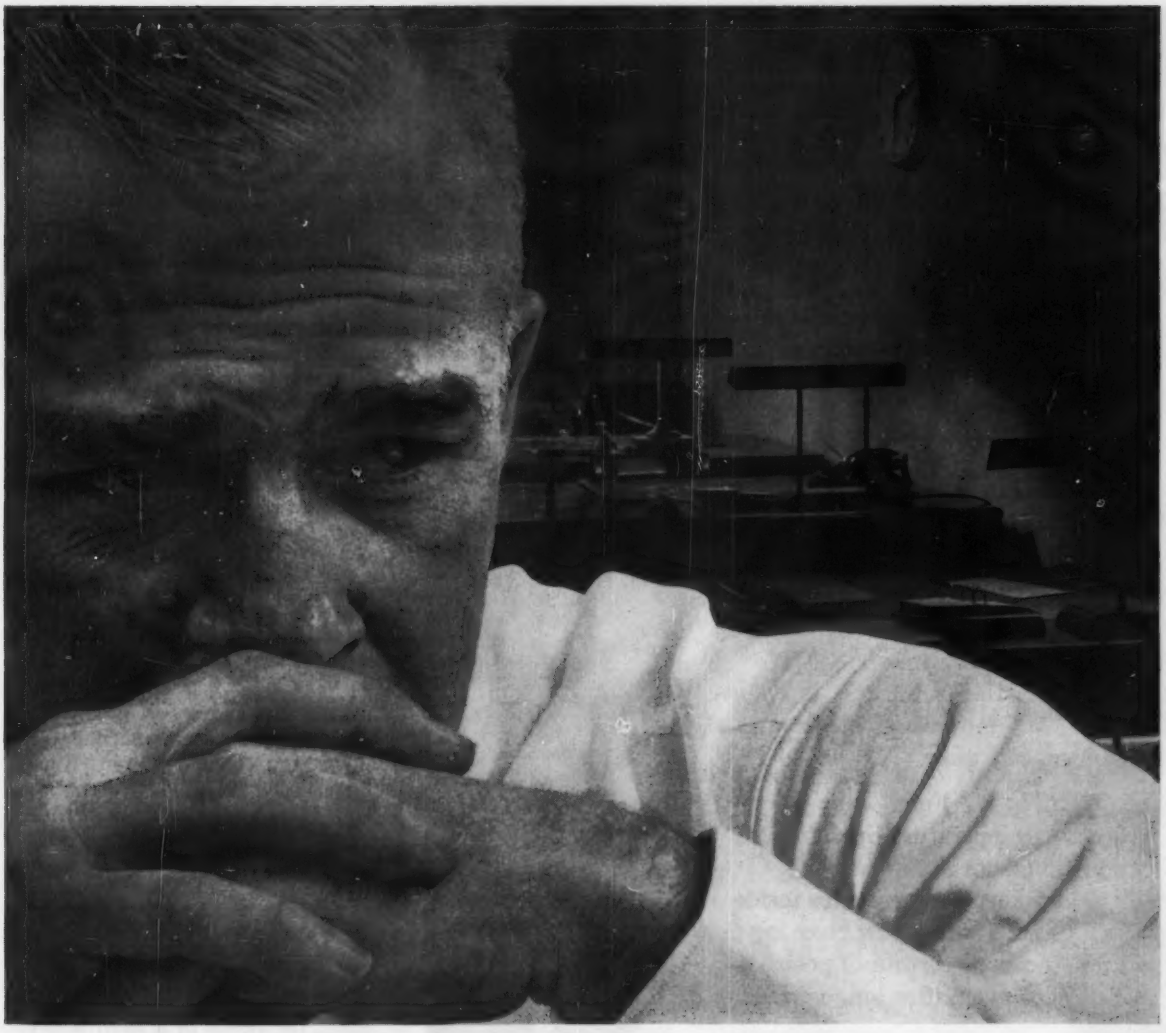

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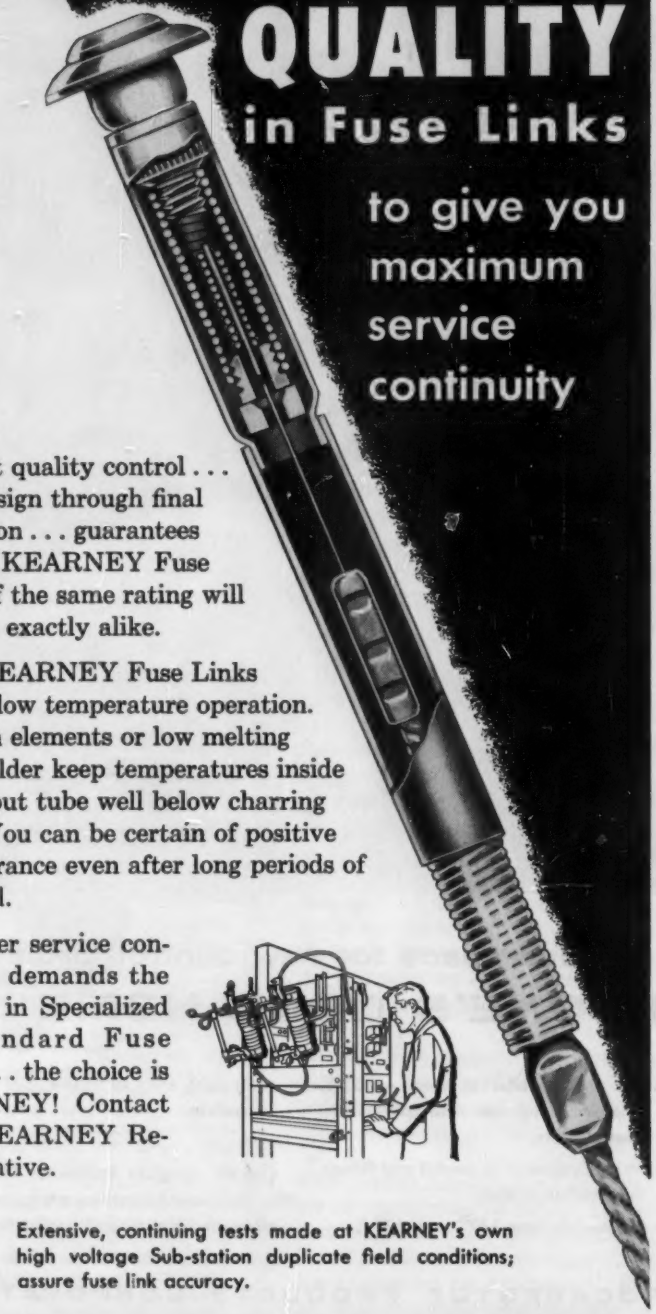

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Personal Briefs

(*Continued from page* 190)

At Westinghouse Electric Corp, the newly formed Service Division has made **R. H. Gordon** service manager of major appliances; **S. A. Voelker** service manager of refrigeration specialties; **L. J. Weaver** manager of renewal parts department, and **J. A. Brown** manager of field service . . . **William F. Tremmel, Jr,** has been named staff assistant to the manager, large lamp dept.

Reliance Electric & Engineering Co has promoted **J. W. Picking** to manager of the Control Division; **E. C. Barnes** to chief engineer of the firm; **K. H. Meyer** to manager-manufacturing services at headquarters, **J. L. Collens** to assistant manager, Ivanhoe Division; **D. E. Bouffard** to manufacturing manager, Ashtabula Division; and **R. G. Davis** to assistant manager, Ashtabula.

Jacques P. Rhodes was recently appointed purchasing agent of McGraw-Edison Co's Pennsylvania Transformer Division. He replaces **Mrs. Lucy K. Packard,** who retired after holding the post for 18 years.

OBITUARY

James L. Bodie, 57, treasurer and director of Arkansas Power & Light Co, died recently at his Little Rock home, the victim of a heart attack. He had been with AP&L for 34 years.

Harry T. Bussman, vice president of Bussman Manufacturing Division of McGraw-Edison Co and co-founder of the former Bussman Manufacturing Co, died recently.

Dr Irving Langmuir, 76, famous scientist and former member of the staff of General Electric Co's research laboratory, died of a heart ailment while vacationing in Falmouth, Mass. Dr Langmuir, who received the world's top scientific awards including the 1932 Nobel Prize in chemistry, developed the gas-filled incandescent lamp and the high-vacuum power tube.

Mit Simms, 84, member of the Arizona Corporation Commission, died recently.

READERS FORUM

Figures Do It

To the Editor:

I was very much interested in the article on page 52 of the July 29 issue of Electrical World. In this article, it is stated that the Central Hudson Gas & Electric Corporation provided 99.96 per cent dependable service in 1956. This is a very excellent record.

After reading the item, I was a little bit concerned as to what our own record might be and whether or not our service was up to the standards which are demanded in general by the public today. After making some calculations, I find that our service on the whole system for the year 1956 was 99.9966 per cent dependable, including storm outage.

H. W. Collings
The Detroit Edison Co
Detroit 26, Michigan

Would Puncture 'Myth'

To the Editor:

Late in my reading and only recently noted the article "Safety Man Gets Help in War on Snake Bites" in your June 24th number.

The language, "Texas has the dubious distinction of having more snake bite deaths than any other state" surely implies that fatalities are plentiful. It is not new. A fine article in National Geographic some time ago had the same implication. Correspondence with the author brought out that she thought that there had been one fatality.

It is unfortunate to perpetuate the myth. It encourages the indiscriminate slaughter of all snakes. As you are undoubtedly aware, snakes make a very important contribution to the ecological balance.

For many years I've more or less publicized a merry offer to pay a nice new one dollar bill for proof of a human fatality due solely to the bite of a wild poisonous snake indigenous to the continental United States.

Perhaps the author of your article might care to compete!

Congratulations on the inauguration of Electrical Newsletter.

G. I. Vincent
103 Burlingame Road
Syracuse 3, N. Y.

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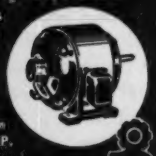

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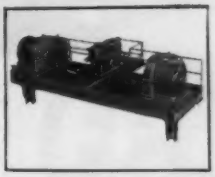

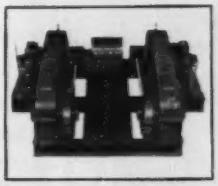

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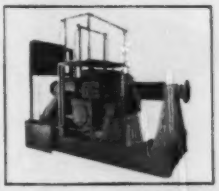

Write for complete information and Engineering Department recommendations.

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Manufacturers Since 1883
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Cole Electric Co.

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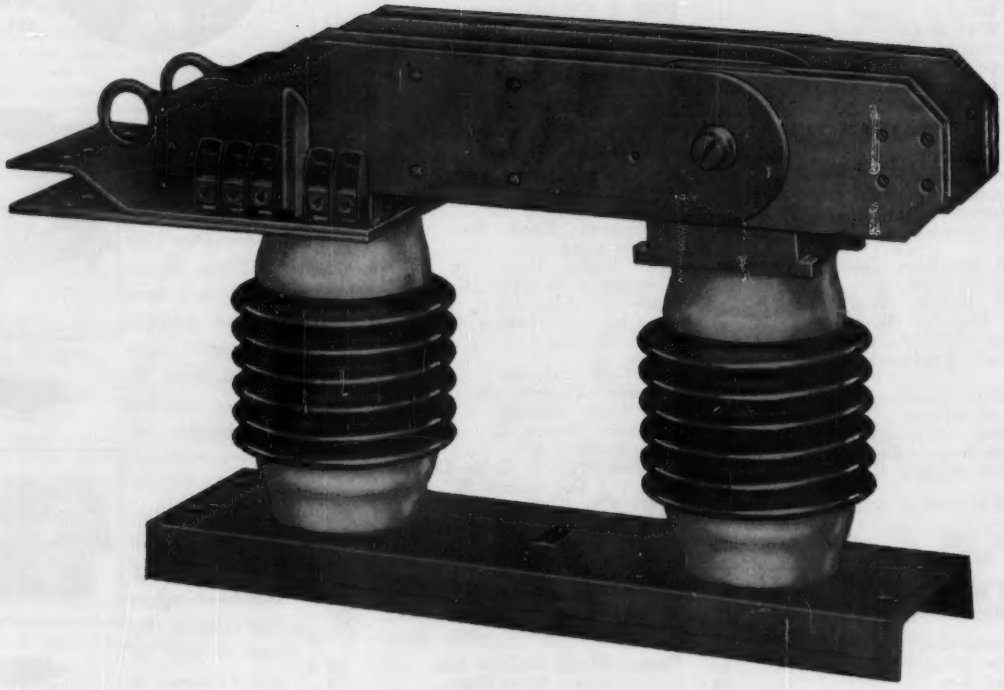


OUTDOOR HOOK STICK DISCONNECTING SWITCH

23,000 Volts—4,000 Amperes—Type Y-2

Single Pole, Single Throw

See Bulletin 20-A

SILVER TO SILVER CONTACTS

NOW Federal Pacific offers you surer protection and utmost operating economy

With a NEW Line of

PROTECTED DISTRIBUTION TRANSFORMERS

Type FSP, 25 kva, 12 kv.

Type FCP, 25 kva, 12 kv.

Federal Pacific's new line of Self-Protected and Current-Protected distribution transformers combine the surest protection with utmost operating economy costs.

The results of recent independent utility tests of all leading distribution transformers, conclusively proved that not only were the new Federal Pacific transformers the best of those tested, but were the *only* ones to *combine* low losses and high efficiency in one and the same transformer.

Fully Self-Protected (Type FSP), and Fully Current-Protected (Type FCP) distribution transformers are available from 10 kva through 100 kva, 15 kv.

For further information call your nearest Federal Pacific Engineering Representative or write to the Pacific Switchgear Division, 5815 Third Street, San Francisco 24, California.

Finest Products Engineered

FEDERAL PACIFIC ELECTRIC

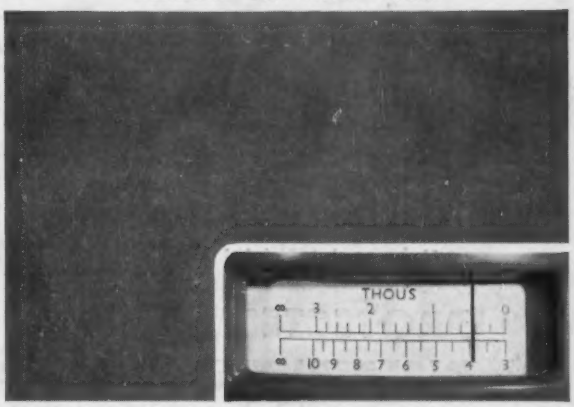
COMPANY

Tests Prove Kuhlman "HOT PAINT"

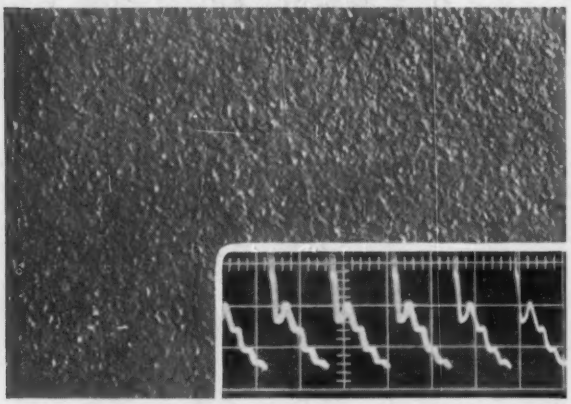
flows on smoother, gives better coverage

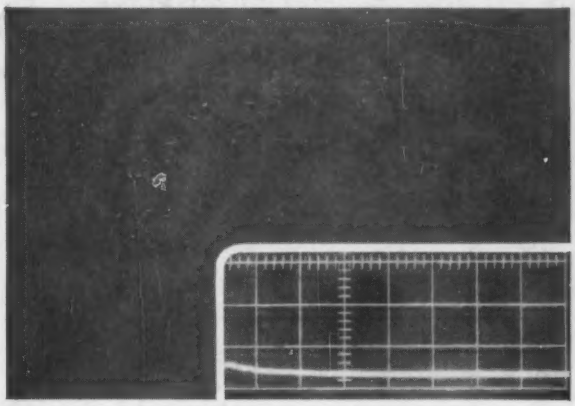
ORDINARY TRANSFORMER FINISH

KUHLMAN "HOT PAINT" FINISH



The above mil gauge readings measuring paint thickness, prove that the film thickness of the Kuhlman "Hot Paint" finish is considerably greater





This is a porosity detector test. Any minute pin-holes in the transformer paint allows the detector to make electrical contact with the transformer tank metal. A signal results (shown on the oscilloscope screen at the left) indicating a porous surface. No signal (Kuhlman "Hot Paint" finish) indicates a non-porous surface.

KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman representative, and are the first one to notify Dept. SA-I, Kuhlman Electric Company, P.O. Box 288, Birmingham, Michigan, you will receive a valuable gift.

Here's the reason why:

Kuhlman distribution transformer finish is uniformly heated before it is applied.

This "HOT PAINT" requires less solvent for a given viscosity and allows more *weather-resistant* paint solids to be deposited on the tank surface. As a result Kuhlman "Hot Paint" covers more evenly—without running, thinning out, or orange peeling. It produces a heavier filmed, non-porous finish that will last longer and cut re-painting costs.

The above tests prove "Hot Paint's" exceptional quality—but we invite you to make your own comparison. Ask your Kuhlman representative to show you the Kuhlman "Hot Paint" finish. You'll see the difference in a glance!

5716 c

KUHLMAN

ELECTRIC COMPANY

GENERAL OFFICES: Birmingham, Michigan